United States
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Agency

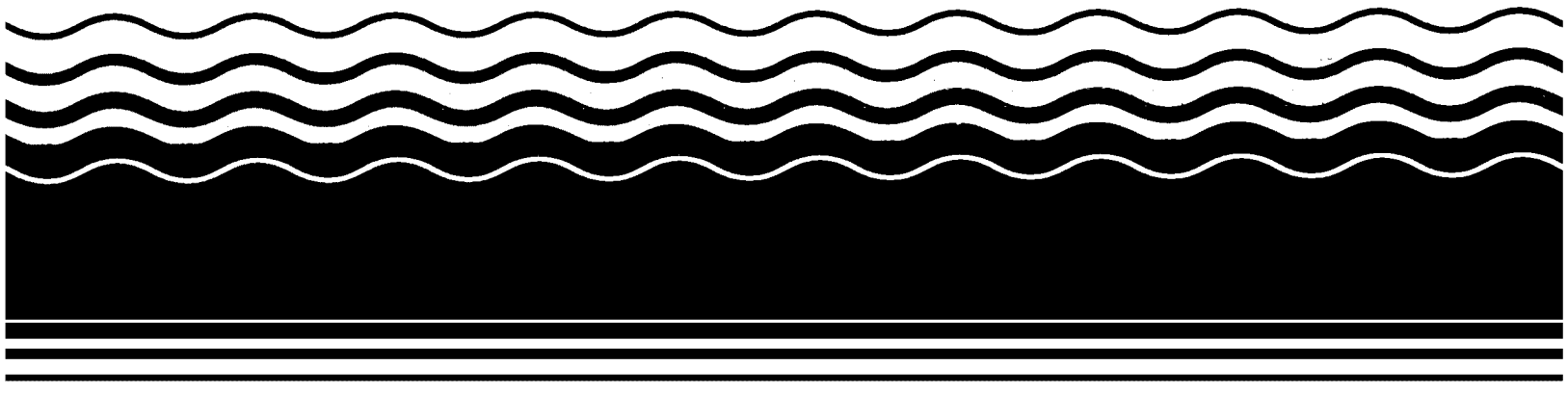
Office of
Emergency and
Remedial Response

EPA/ROD/R10-92/043
September 1992

EPA

Superfund Record of Decision:

Joseph Forest Products, OR



NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R10-92/043	2.	3. Recipient's Accession No.
4. Title and Subtitle SUPERFUND RECORD OF DECISION Joseph Forest Products, OR First Remedial Action - Final			5. Report Date 09/30/92 6.
7. Author(s)			8. Performing Organization Rept. No.
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12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460			13. Type of Report & Period Covered 800/000 14.

15. Supplementary Notes

PB93-963613

16. Abstract (Limit: 200 words)

The 18-acre Joseph Forest Products (JFP) site is a wood-processing facility in the City of Joseph, Wallowa County, Oregon. Land use in the area is predominantly industrial and agricultural. The City of Enterprise uses two springs located 4,000 feet from JFP to serve as its municipal water supply. In 1974, and again from 1977 to 1985, Joseph Forest Products, Inc., used the site as a lumber mill, processing wood into lumber products. Structures located on the facility include a sawing facility, a wood treating facility and an adjacent drip pad, a drying building, a pumphouse, and maintenance facilities. Wood treatment operations consisted of mixing a concentrated preservative paste with water and treating lumber products with the mixture of chromium, copper, and arsenic (CCA) in a retort. Process wastes, including wood chips, sludge, and other materials remaining in the retort, were removed periodically and placed in a cement pit adjacent to the treatment building. In 1974, the treatment building and surrounding buildings were destroyed by fire. During fire-fighting operations approximately 200 gallons of contaminated treatment paste and 3,000 gallons of treatment solution were released into the soil. It is estimated that more than

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Joseph Forest Products, OR
First Remedial Action - Final
Contaminated Media: soil, debris
Key Contaminants: metals (arsenic, chromium, lead), inorganics (asbestos)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 66
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

EPA/ROD/R10-92/043
Joseph Forest Products, OR
First Remedial Action - Final

Abstract (Continued)

160,000 pounds of CCA preservative concentrate were used at the site between 1978 and 1985. As a result of a 1984 state investigation that identified elevated levels of metals, EPA conducted a site inspection, which revealed metal contamination in surface water and soil. In 1985, a state enforcement action instructed JFP to ship eleven 55-gallon drums of waste material to an offsite hazardous waste landfill. In 1991, during EPA's remedial investigation, a removal action involved excavation and offsite disposal of highly contaminated soil. This ROD addresses a final remedy for the excavation and disposal of contaminated soil and debris remaining onsite. The primary contaminants of concern affecting the soil and debris are metals, including arsenic, chromium, and lead; and inorganics, including asbestos.

The selected remedial action for this site includes demolishing contaminated onsite structures, including the process, storage, and mixing tanks, and the wooden structures and concrete slabs, followed by offsite disposal; decontaminating the concrete drip pad and tanks, followed by recycling or offsite disposal of debris; excavating surface and subsurface soil, with screening and segregation of hazardous waste for offsite disposal, with stabilization, if necessary, prior to disposal at appropriate facilities; backfilling any excavated areas; removing asbestos from the facility, with offsite disposal; removing underground storage tanks and any associated contaminated soil, with scrapping or offsite disposal; monitoring ground water; and implementing institutional controls, including deed and land use restrictions or environmental notices. The estimated capital cost for this remedial action is $550,000, with an annual O&M cost of $24,000 for 3 years.

PERFORMANCE STANDARDS OR GOALS:

Chemical-specific soil clean-up goals, which are based on EPA risk-based standards, include surface soil clean-up levels (10^{-5}) for arsenic 36 mg/kg; debris surface soil 1351 mg/kg; copper 10,000 mg/kg; for subsurface soil (10^{-4}), arsenic 336 mg/kg; chromium debris subsurface soil 1351 mg/kg; and copper 10,000 mg/kg.

DECLARATION

Joseph Forest Products
Superfund Site

SITE NAME AND LOCATION

Joseph Forest Products
Wallowa County, Oregon

STATEMENT OF PURPOSE

This decision document presents the remedial action selected by the U.S. Environmental Protection Agency (EPA) for the Joseph Forest Products Superfund Site (Site) in Wallowa County, Oregon. The selected action was developed in accordance with the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based on the Administrative Record for this Site. The attached index identifies the items that comprise the Administrative Record upon which the selection of the remedial action is based.

The State of Oregon concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances at and from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public, health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the Site includes excavating contaminated soils to specified cleanup levels, demolishing the existing treatment building, decontaminating process equipment, and transporting contaminated soil and debris to an approved off-site disposal facility. The remedy is designed to significantly reduce exposure to the contaminated soils, debris, and equipment. The goal of the selected remedy is to remove and remediate soils and debris to levels that are protective of human health and the environment.

<u>The major components of the selected remedy include</u>:

- Excavation of contaminated surface and subsurface soil to specified cleanup levels, demolition of the treatment building, decontamination of the drip pad and treatment equipment, and off-site disposal of soils and debris. Soil which is classified as a hazardous waste would be treated as required to meet the land disposal requirements and disposed in a permitted Resource Conservation and Recovery Act (RCRA) hazardous waste disposal facility.

- Excavation of abandoned Underground Storage Tanks (USTs), decontamination of the tanks if any residuals are present, and

transport of the tanks off-site for disposal or salvage as scrap metal. Soil samples would be collected from beneath the tanks and analyzed for total petroleum hydrocarbons as required by Oregon Department of Environmental Quality (DEQ) tank closure regulations. If soil contamination is discovered, contaminated soil would be excavated and disposed of off-site. The excavation would be backfilled with clean soil.

- Removal of asbestos from the abandoned wood drying building and placing it into sealable plastic bags. After all materials have been removed, the wall surfaces would be vacuumed. Asbestos-containing wastes would be disposed of off-site in a trench meeting regulatory requirements for asbestos waste disposal.

- Use of institutional controls such as deed restrictions, or use of an environmental notice to ensure appropriate consideration of Site conditions in future land use decisions.

- A groundwater monitoring program would be implemented to verify that contaminant levels in all wells and the City of Enterprise water supply allow for unlimited use.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment; complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action; and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element.

Signature sheet for the Joseph Forest Products Record of Decision by the U.S. Environmental Protection Agency.

Dana A. Rasmussen

DANA A. RASMUSSEN
Regional Administrator, Region 10
U.S. Environmental Protection Agency

9/30/92
Date

DECISION SUMMARY

INTRODUCTION

The Joseph Forest Products Site ("JFP Site" or "Site) was nominated to the National Priorities List (NPL) in June 1988. The nomination was based on a Hazard Ranking System (HRS) score for the site resulting from a site assessment performed by the United States Environmental Protection Agency (EPA) in 1986. The Site was placed on the NPL in March 1989 (54 Federal Register 13296, March 31, 1989) pursuant to Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §9605, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA or Superfund).

Pursuant to Executive Order 12580 (Superfund Implementation) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300, EPA performed a Remedial Investigation/Feasibility Study (RI/FS) for the Site. The Remedial Investigation (RI), completed July 1992, characterized contamination in soils, surface water and groundwater. A Baseline Risk Assessment was completed in March 1992 and evaluated potential effects of the contamination on human health and the environment. The Feasibility Study (FS), completed in September 1992, evaluated alternatives for remediating contamination.

I. SITE DESCRIPTION

Name and Location

The JFP Site is located in Wallowa County, Oregon, approximately 0.75 miles northwest of the City of Joseph, on Russell Lane. The Site consists of a parcel of approximately 18 acres in the northwest quarter of the southwest quarter of Section 30, Township 2 South, Range 45 East of the Willamette Meridian. See Figure 1 for the location of the JFP Site. Figure 2 shows the Site plan and significant features of the site. The Site is divided into east and west parcels by the Union Pacific Railroad tracks and right-of-way.

Relevant structures at the JFP Site on the east parcel include the treatment building and the adjacent concrete foundation used as a drip pad, a maintenance shop, an abandoned lumber drying building, the remains of a collapsed wigwam burner, and a developed spring with pumphouse (see Figure 2). The west parcel includes the location of the former JFP office building, JFP's former lumber sawing facilities (including saws and a debarker), other abandoned buildings, and a well. Electrical and telephone utilities were apparently supplied by overhead lines, with underground utilities limited to on-site water distribution and possibly steam lines related to previous lumber mill operations.

Topography and Vegetation

The JFP Site is located on Alder Slope, an alluvial/colluvial fan associated with the foothills of the Wallowa Mountains. In general, the topography of the Site is relatively flat. The eastern portion of the Site (i.e., east of the railroad tracks) slopes to the north-northeast.

Approximate surface elevations over most of the eastern portion of the Site range from 4085 feet Above Mean Sea Level (AMSL) at the south boundary to 4075 feet AMSL at the north boundary. The low point is the gully formed by the outlet stream from the JFP spring. This gully is located at the northeast corner of the Site. The bottom of the gully is at an approximate elevation of 4067 feet AMSL. The high point of the eastern portion of the Site is the extreme southwest corner, which has an approximate elevation of 4090 feet AMSL.

The western portion of the Site slopes to the north and east. The surface is slightly steeper than the eastern portion. Surface elevations range from a high of approximately 4100 feet AMSL at the southwest corner to 4077 feet AMSL at the northeast corner.

Vegetation at the Site consists of perennial bunch grasses and sparse trees and shrubs. Grasses are found over most of the undisturbed areas of the Site. Trees and shrubs are found along the banks of the stream and spring, and at other scattered locations.

Adjacent Land Uses

The JFP Site is located in an industrial and agricultural area. The property is bounded by Russell Lane to the north, and is bordered by property owned by the Clifford C. Hinkley Estate on the east and south, Sequoia Forest Products to the south, and by the Joseph Airport to the west. The areas north, east, and south of the Site are primarily agricultural (e.g., grazing, forage crops). The nearest residence is the Roup-Daggett residence, which is north of the Site approximately 100 feet north of Russell Lane. Sequoia Forest Products is an active lumber mill and is the major industrial activity in the area.

Surface Water and Groundwater Resources

Both surface water and groundwater resources exist near the JFP Site. Surface water resources include nearby rivers, creeks, lakes, and springs. The larger streams and lakes, including Hurricane Creek, the Wallowa River, and Wallowa Lake are used for recreational and irrigation. Developed springs may be used for domestic and agricultural purposes. The most important of these springs in the vicinity of the Site are two springs, located approximately 4000 feet north of the JFP Site, which serve as the municipal water supply to the City of Enterprise. The JFP Site is located within the City of Enterprise Watershed Protection Area.

Shallow groundwater is used locally for domestic purposes. Other than the shallow on-site well, which is not currently used, the nearest domestic well is located at the Roup-Daggett residence, across Russell Lane to the north of the Site. Depths to the shallow aquifer vary in the vicinity of the JFP Site, ranging from less than 10 feet to as deep as 80 feet.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

History of Site Activities

JFP began wood treatment operations in 1974 utilizing a vacuum-pressure treatment process. Treatment occurred within the treatment building

identified in Figure 2. The treatment process involved initial make-up of the treatment solution, loading a pressure vessel (retort) with lumber, placing the retort under vacuum for approximately one hour, filling the retort with treatment solution, pressurizing the solution-filled retort for approximately two hours, and finally, pumping out the excess treatment solution and removing the treated lumber for drying. The initial solution make-up was performed in a 407-gallon mixing tank near the head end of the retort; the solution was then transferred to a 5100-gallon storage tank located just above the head end of the retort. The retort vessel had a total volume of 3990 gallons. A layout of the treatment building and equipment is shown in Figure 3.

During the initial operations, JFP used a water-based preservative known by the trade name of Osmose K-33 (also known as chromated copper arsenate (CCA) type II or CCA type B). This product is reported to have a chemical composition of 35.3 percent chromium (VI) (as CrO_3), 19.6 percent copper (as CuO), and 45.1 percent arsenic (as As_2O_5). The preservative was supplied to JFP as a 72 percent oxide paste in 20-gallon drums. One 20-gallon drum was used to produce approximately 1500 gallons of treatment solution.

During initial operations, treated wood at JFP was transferred to a drying area at the north side of the Site adjacent to Russell Lane. After only two weeks of operations in 1974, the treatment building and surrounding buildings were destroyed by a fire. An estimated 200 gallons of concentrated treatment paste and approximately 3000 gallons of treatment solution in the storage tank were lost. It is assumed that the material was washed onto nearby soil during fire fighting operations. Based on the reported composition of Osmose K-33, the total amount of metals released was estimated to be 810 pounds arsenic, 500 pounds chromium, and 430 pounds copper.

After the fire, JFP did not resume treatment operations until late 1977. In 1977, the treatment building was rebuilt to cover only the head-end area (solution mixing tank, cement sump, and pumps and compressors). The building was extended to cover the retort in 1979, and a cement block wall was added to the cement slab foundation for spill containment. When treatment operations resumed in 1977, Osmose K-33 CCA-type C was used instead of the previously-used CCA-type B preservative. CCA-type C is composed of 47.5 percent CrO_3, 18.5 percent CuO, and 34 percent As_2O_5. The treatment process was the same as previously described. Empty concentrate containers were rinsed and stored outside the treatment building along the northeast side. After processing each batch of wood, a heel of approximately 50 gallons of treatment solution could not be pumped from the retort and was drained into a cement sump beneath the storage tank. This solution was then later pumped back into the storage tank for reuse. Process wastes, including wood chips, sludges and other materials remaining in the retort, were periodically removed and placed in a cement pit adjacent to the east side of the treatment building (see Figure 3).

JFP and manufacturer records indicate that JFP used approximately 160,380 pounds of Osmose K-33 preservative concentrate from 1978 through July of 1985, when operations ceased.

The JFP Site was owned and operated by Joseph Forest Products, Inc. from 1974 through 1985. The company filed for bankruptcy in June 1984, and ceased operations in 1985. The Site property had been purchased from Mr. Clifford Hinkley, the adjacent land owner, under a real estate contract. After JFP declared bankruptcy and defaulted on the purchase contract, the property title

reverted to the Hinkley Estate, which is the present property owner.

History of Federal and State Site Investigations and Removal and Remedial Actions Conducted Under CERCLA or Other Authorities

Initial regulatory involvement with JFP included a Site visit by Oregon Department of Environmental Quality (DEQ) staff in 1984. On September 25, 1984, DEQ collected samples of soil, waste material, and surface water from the Site. Subsequent chemical analysis of those samples indicated elevated levels of chromium, copper, and arsenic in soil adjacent to the drip pad and treatment building, waste material and sludges from the waste pit adjacent to the treatment building, and surface water collected on the drip pad. In the case of the sludge from the pit and inside the treatment building at the end of the retort, "extraction procedure" (EP) toxicity hazardous waste limits for chromium and arsenic were exceeded. EP is the test for determining whether a waste exhibits the toxicity characteristic of a hazardous waste. EP limits for chromium and/or arsenic were exceeded in analyses of four out of six soil samples from the Site. EP limits and primary drinking water standards for chromium and arsenic were exceeded in analyses of samples of rain water collected from the waste pit and from the drip pad, and in a sample of container rinse water. Analyses of two water samples collected from the spring on the Site north of the treatment building indicated concentrations of copper, chromium, and arsenic below primary and secondary drinking water standards.

Following this initial sampling effort, JFP was issued a Notice of Violation (#HW-ER-85-05, dated March 7, 1985) from the DEQ for unauthorized disposal and storage of hazardous waste. JFP responded in that same month by removing empty containers and arranging for disposal of chemical wastes on Site. DEQ submitted a preliminary assessment (PA) report to EPA on June 8, 1985 (Site number 068728280). On August 22, 1985, JFP shipped eleven 55-gallon drums of waste material (consisting primarily of sludge and wood chips from the pit adjacent to the treatment building) to an off-site hazardous waste landfill. By late 1985, it had become apparent that JFP's insolvency would prevent any further corrective actions on the part of JFP.

A "site inspection" (SI) of the JFP Site was conducted by EPA contractors during September and October of 1985. Sampling efforts continued from January through April 1986. The SI report was issued in May of 1987. Field activities during the SI included installation of monitoring wells and collection of samples of soil, surface water, and groundwater. Samples were analyzed for inorganic and organic contaminants. The principal contamination of concern identified in the SI was elevated levels of metals, primarily arsenic, chromium, and copper, in soils at the Site. The highest levels of these metals detected were 12,400 mg/kg arsenic, 7830 mg/kg chromium, and 13,000 mg/kg copper. The most highly contaminated soil samples were collected along the east side of the treatment building. Several of these samples also contained arsenic and chromium in excess of EP limits. In addition, the SI results indicated detectable levels of total metals in some groundwater and surface water samples. As a result of the SI and the subsequent HRS score, the JFP Site was nominated to the NPL.

A search for "potentially responsible parties" or "persons" (PRPs) was conducted as part of the initial CERCLA activities for this Site. Based on the results of the PRP search, "special notice" letters, as identified by

Section 122(e) of CERCLA, 42 U.S.C. 9622(e), were sent to Joseph Forest Products and the Estate of Clifford Hinkley requesting good faith proposals to conduct the RI/FS. Neither party submitted a proposal.

The RI/FS was initiated in January 1990. Field activities associated with the RI/FS were begun in July 1990. The first phase of field investigations was completed in August 1990. Subsequent periodic groundwater monitoring was performed in October 1990; January, April, and September 1991; and April 1992. Based on the results of the first phase of RI activities, a removal action was carried out by EPA in October and November 1991. The removal action involved excavation and off-site disposal of highly contaminated soil identified during the RI.

III. COMMUNITY RELATIONS HISTORY

CERCLA requirements for public participation include releasing the RI/FS reports and the "Proposed Plan" (which preceded this Record of Decision) to the public and providing a public comment period on the FS and "Proposed Plan". EPA met these requirements on August 14, 1992 by placing both documents in the public information repositories for the Site and mailing copies of the "Proposed Plan" to individuals on the mailing list. EPA published a notice of the release of the RI/FS and proposed plan in the La Grande Observer on August 18, 1992. Notice of the 30 day public comment period and a description of the "Proposed Plan" were included in the newspaper notice. The public comment period ended on September 17, 1992 and no comments from the public were received.

To date, the following community relations activities have been conducted by EPA for the Site:

April 1990	EPA released a fact sheet explaining the Remedial Investigation and announcing the dates of interviews for the Community Relations Plan.
June 1990	EPA released the Community Relations Plan, which included interviews from member of the public and local officials.
March 19, 1991	EPA mailed a fact sheet which gave the results of the first round of the field investigation and explained upcoming activities.
October 1, 1991	A fact sheet announced plans to remove highly contaminated soil from the Site.
August 14, 1992	EPA mailed the Proposed Plan, which explained the results of the RI/FS, all of the alternatives that were considered, and EPA's preferred cleanup alternative. The fact sheet also announced the public comment period.
August 18, 1992	Newspaper ad ran in the La Grande Observer announcing the beginning of the comment period and explained EPA's preferred cleanup alternative.
August 17 - September 17, 1992	Public Comment Period.

September 1992 Responsiveness Summary prepared.

IV. SCOPE AND ROLE OF RESPONSE ACTION WITHIN THE SITE STRATEGY

The selected remedy is the second response action conducted at the JFP Site and represents the final remedial action for the Site. EPA conducted a removal action in the fall of 1991 after the RI field investigation located and characterized highly contaminated soils in the treatment building and drip pad areas of the Site. EPA determined that the removal action was necessary because the highly contaminated soils posed a threat to the groundwater pathway. Approximately 600 cubic yards of soil contaminated with arsenic, chromium and copper was excavated and transported to the Environmental Services of Idaho Inc. hazardous waste disposal facility for disposal. Security fencing was installed around the treatment building to prevent access. The results of the RI/FS shows that other contaminated material remaining on site needs to be addressed.

The primary threat remaining at the JFP Site is the potential for exposure to metals resulting from contact with contaminated surface soils. The Site is located close to several residences. This response action is designed to remove the threat to public health by significantly reducing the volume of the contaminated soil and removing contaminated debris and equipment which could serve as a continued source of contamination and exposure risk to humans.

In addition, this response action will reduce the potential for the contaminated soil to act as a source for groundwater contamination. Although low levels of metals were detected in groundwater monitoring wells at this Site, the concentrations are currently below Maximum Contaminant Levels (MCLs) at the City water supply Springs and all wells tested.. Therefore the current levels of metals in the groundwater at the Site are not believed to pose a significant public health threat. Removal of on-site sources of soil contamination and debris, which could serve as continued sources if unaddressed, will reduce the potential for groundwater contamination. Groundwater monitoring will be continued for several years after implementation of the remedy to confirm that contaminant levels are below health based levels and that groundwater supplies remain safe for human consumption. If the levels of metal contaminants exceed these health-based levels, as determined by the groundwater monitoring program, appropriate measures would be taken by EPA under a separate response action.

V. SUMMARY OF SITE CHARACTERISTICS

Geology and Soils

The major geologic feature in the vicinity of the JFP Site is the Wallowa Mountains. The Wallowa Mountains are located immediately to the south of the JFP Site and are composed of a dissected dome of sedimentary and volcanic materials, intrusive granodiorite, and intrusive and extrusive basalt. The range has been shaped by the intrusion of the Wallowa Batholith which forced the overlying sedimentary formations upward and outward.

The JFP Site is within the Wallowa River Valley. Surficial materials in

the vicinity of the Site include glacial, alluvial, and colluvial deposits. Glacial deposits are found on the valley walls and floor. Alluvial deposits are found on the valley floor. Colluvium is found on the valley walls and floor overlying glacial deposits. The JFP Site is located on Alder Slope, an alluvial/colluvial fan associated with the foothills of the Wallowa Mountains.

Monitoring well log data collected during the SI indicate that the Site is underlain by glacial till at depths of 0.3 to 4 feet. The thickness of the till was reported to approach 20 feet or more. The till was estimated to consist of eroded material from both the Wallowa River and Hurricane Creek valleys. The till was noted to be overlain with sediments of coalescing alluvial/colluvial fans.

The soils that have developed at the JFP Site reflect the mixed and highly variable parent material source. The soil at the Site is mapped as Matterhorn gravelly fine sandy loam, 0 to 3 percent slope. The soils are dominated by coarse rock fragments (as high as 70 percent by volume cobbles and gravel in the subsoil). Matterhorn soils have high surface permeability and low water holding capacity. These soils are also moderately alkaline and calcareous throughout the profile.

Hydrology

Principal surface water features in the vicinity of the JFP Site originate in the Wallowa Mountains and are fed primarily by runoff and snowmelt. These features, shown in Figure 4, include Hurricane Creek to the west, the Wallowa River to the east, and Wallowa Lake to the south. Hurricane Creek drains approximately 30 square miles. The creek flows northeast and is within one-half mile of the JFP Site at its closest point. The Wallowa River drains approximately 50 square miles upstream of the JFP Site and the flow in the vicinity of the JFP Site is controlled by Wallowa Lake. The lake is approximately four miles long, 0.75 miles wide, and has a maximum storage capacity of 47,000 acre-feet.

Groundwater in the Wallowa River Valley occurs in both shallow surficial aquifer systems in the unconsolidated surface deposits, and in deeper systems within underlying volcanic sequences. Depths to the shallow aquifer vary in the vicinity of the JFP Site, ranging from less than ten feet to as deep as 80 feet. The depths to groundwater noted in the Site monitoring wells have ranged from 2.5 to 13.3 feet. Based on observations of groundwater elevations in seven monitoring wells at and near the JFP Site, a groundwater flow direction from southwest to northeast across the Site is inferred. Shallow groundwater is expected to discharge into the Wallowa River to the northeast of the Site. During installation of the monitoring wells as part of the SI, the static water levels in completed wells were consistently observed to be higher than the depths at which water was first encountered during drilling. These observations are consistent with location of the Site in a groundwater discharge area.

Evidence of groundwater discharge in the vicinity of the JFP Site is also provided by springs. Groundwater at the JFP Site is observed to discharge most of the year from a developed spring on the Site, with subsequent surface flow to the northeast into the Wallowa River. Numerous ephemeral springs have been observed in the low area across Russell Lane to the north of the JFP Site. This area also drains into the Wallowa River.

There are two developed springs, located approximately 4000 feet north of the JFP Site, which serve as the municipal water supply to the City of Enterprise. The locations of springs are shown in Figure 4.

The climate of the upper Wallowa River Valley is influenced by the close proximity of the Wallowa Mountains. Mean annual precipitation at the City of Joseph is 19.4 inches. Potential evapotranspiration is 24 to 36 inches per year. Mean annual temperature is approximately 45°F.

Contaminant Characteristics

Potential sources of contamination at the Site were identified during preparation of the RI/FS Work Plan. These sources were identified based on data presented in the SI report and from observations made at the Site during RI/FS Work Plan preparation. Known or suspected contamination sources identified in the RI/FS Work Plan include:

- Spills and leaks of CCA treatment solution from the treatment building and drip pad;
- Treatment chemical drippage in the four treated lumber storage areas;
- Spills or leaks from wood treating vats on the Hinkley Property (adjacent to the JPF Site);
- Suspected asbestos-containing material (ACM) in the abandoned wood drying building; and
- Abandoned drums and underground storage tanks (USTs)

The RI was undertaken to determine the nature and extent of contamination at these potential source area. In addition, the potentially affected environment, including groundwater and surface water was sampled. Relevant results of the RI are summarized below. Based on the results of the RI, a removal action was undertaken to remove highly contaminated soils adjacent to the treatment building and drip pad. The results of the removal action in reducing levels of contamination are also described below.

Background Metals Concentrations

To assess the nature of metals contamination at the Site, it was necessary to determine local background concentrations of metals in soils. Triplicate samples were collected at four locations apparently unaffected by JFP operations. The results of metals analysis of these samples are summarized in Table 1.

Surface Soils Associated with the Treatment Building and Drip Pad

Surface samples were collected around the perimeter of the drip pad and treatment building to define the levels and extent of contamination resulting from spills and leaks. Samples were collected at regular intervals in two concentric rings around the treatment building and drip pad perimeter and analyzed for total metals. Analytical results are summarized in Table 2. Comparison of these results with background results indicates elevated and

highly variable concentrations of arsenic, chromium, and copper. The most highly contaminated areas exist to the east of the treatment building, around the treatment building apron, and along the north side of the drip pad. Relatively low levels of contamination were noted along the south, south-east, and south-west sides of the drip pad. The levels of contamination appear to decrease rapidly with distance from the base of the foundations. In general, the levels of contamination in the samples from the outer ring were much less than in corresponding samples from the inner ring. This pattern suggests that elevated levels of surface contamination should be confined to a relatively narrow band around the drip pad. This pattern is consistent with spillage or leakage from the pad as the source of contamination.

Eight of the inner ring perimeter samples, plus two field duplicates, were also analyzed for semivolatile organic compounds. The results of the semivolatiles analysis was consistent with the results of the analysis of the background samples.

Subsurface Soils Associated with the Treatment Building and Drip Pad

Subsurface samples were collected in areas of expected high contamination to determine the vertical extent of contamination. These sample locations were east of the treatment building, at the southeast corner of the treatment building apron, and at the northeast corner of the drip pad. Samples locations are identified as locations SUB-1 through SUB-6 in Figure 5. Analytical results are summarized in Table 3. Comparison of these results with background results indicates elevated concentrations of arsenic, chromium, and copper.

The highest concentrations of arsenic, chromium, and copper were observed at locations SUB-2, SUB-3, and SUB-4, and were consistent with visible staining of the soil materials. At SUB-2 and SUB-3, concentrations at the surface are less than subsurface concentrations. This trend is consistent with the apparent subsurface sources of contamination observed at these locations (i.e., leaks in sumps).

At the other locations, contaminant concentrations decrease with depth, suggesting a surface source of contamination.

Removal Action Around Treatment Building and Drip Pad

The removal action implemented during October and November 1991 involved excavation and removal of approximately 600 cubic yards of contaminated soil from the JFP Site. During the removal action, sampling and analysis was performed to delineate the extent of the soil to be excavated and to confirm the concentrations remaining after disposal. The boundaries of the excavations and locations of confirmatory samples are shown in Figure 6. Analysis to delineate the extent of contamination was performed on-site using a portable X-ray fluorescence (XRF) analyzer. After the contaminated soils were excavated, samples were collected from within and adjacent to the excavations. These samples were submitted to a Certified Laboratory Program (CLP) laboratory for analysis of total arsenic, chromium, and copper. Concentrations of total arsenic, chromium, and copper detected in these confirmatory samples are presented in Table 4.

The results of the confirmatory soil sampling indicate that most of the

highly contaminated soils were removed from the Site. The only highly contaminated soils remaining which could not be excavated are those under the treatment building. The soil under the head end of the building was green in color and appeared to be highly contaminated. Two samples were collected and confirm high levels of contamination (see Table 4, samples T1100325 and T1100326). Additional information on the removal action is included in the RI/FS and Administrative Record.

Soil Beneath Drip Pad

Soil samples were collected at 3 locations beneath cracks in the drip pad to determine whether migration of contaminants had occurred through the pad. The results of analysis for total metals in soil samples collected from beneath the drip pad are shown in Table 5. These results indicate levels of arsenic, chromium, and copper above background. The levels of arsenic, chromium, and copper are comparable to the levels observed in the treated lumber storage areas and do not appear to be indicative of gross contamination.

Swipe Samples of Drip Pad and Treatment Building Floor

Surface swipe samples were collected from three discrete locations on the surface of the drip pad and one location inside the treatment building. Swipes were collected using filter papers saturated with distilled water and dilute nitric acid and analyzed for total metals. All sample locations were apparently contaminated with CCA, as evidenced by green staining. The results indicate that portions of this contamination are extractable by distilled water and dilute nitric acid.

Treated Lumber Storage Areas

Surface soil samples were collected from the four known or suspected lumber storage areas. Analytical results are summarized in Table 6. In general, the levels of arsenic, chromium, and copper in these samples appear to be higher than levels in background samples.

The levels of arsenic, chromium, and copper in the storage area samples are generally much less than the levels observed in samples from the treatment building and drip pad perimeters. These results appear to be indicative of slight CCA contamination. Such contamination would be consistent with drippage from of treatment solution treated lumber during drying.

A subset of the storage area samples were also analyzed for semivolatile organics. Results were consist with results from analysis of background samples.

Hinkley Property

Three soil samples plus one field duplicate were collected from the Hinkley Property near vats which were suspected of being used for lumber treatment. These samples were analyzed for total metals and the results showed arsenic, chromium, and copper to be within the range of concentrations for the background samples. The soil samples from the Hinkley Property were also analyzed for semivolatile organics. Of interest was pentachlorophenol (PCP), which had been detected in a soil sample collected near the vats during

the SI. The SI results showed an estimated concentration of 17,000 ug/kg (17 mg/kg) in this sample and less than 140,000 ug/kg in the field duplicate. Results of the semivolatiles analysis of samples collected from the Hinkley property during the RI showed PCP to be the only semivolatile compound above detection limits. PCP was detected in two of the three samples. A concentration of 11,000 ug/kg was detected in one sample and an estimated concentration of 46,000 ug/kg was measured in the other. A field duplicate of the latter sample had an estimated concentration of 48,000 ug/kg. These results are similar to the SI results and indicate minor PCP contamination in the vicinity of the wood treating vats.

Wood Drying Building

Fabric material lining the abandoned wood drying building on the JFP Site was suspected of containing asbestos. This suspicion was based on the appearance of the material and the presence of heating pipes in the building which were apparently used to dry lumber. During the RI, three samples of this material were collected and submitted for analysis of asbestos fibers. The results of these analyses show the presence of asbestos fibers identified as chrysotile in all three samples. The chrysotile content of the samples ranged from three to seven percent. For comparison, material containing one percent or more asbestos fibers is defined under the Clean Air Act to be Asbestos Containing Material (ACM).

Groundwater

Groundwater quality at the JFP Site was monitored using a network of seven monitoring wells installed during the SI. The locations of these wells are shown in Figure

7. Five rounds of monitoring were performed during the RI (July and October 1990; January, April, and September, 1991; and April 1992). Results for analysis of total metals are summarized in Table 7. These results show total metals to be highly variable and apparently elevated in some cases. Evaluation of the groundwater data during the RI indicated that levels of total metals appeared to be related to levels of suspended sediments in turbid groundwater samples. In most cases, these results did not appear to be indicative of contamination from the Site.

Results of dissolved metals analysis were more consistent. Dissolved metals associated with known or suspected Site contaminants were generally below detection. Results of dissolved arsenic, chromium, copper, lead, and zinc above detection are summarized in Table 8. These results show the only well to consistently have dissolved arsenic and chromium above detection is Well MW2. This well is the well most immediately downgradient of the treatment building. Levels of arsenic and chromium in samples from this well appear to represent contamination from the Site.

Surface Water

Surface water sampling during the RI included collection of samples from the Wallowa River at and downstream of the Site, from the on-site spring, and from the two City of Enterprise springs. The river was sampled during July 1990, and the springs were sampled during each of the groundwater monitoring events. None of the samples of surface water or the City of Enterprise

springs detectable levels of dissolved arsenic, chromium, or copper.

Potential Routes of Migration

The results of the site characterization show chemicals of concern to be present in surface and subsurface soils and groundwater. Potential routes of migration include air, surface water, and groundwater. Surface contaminants may migrate in air through suspension and windborne transport of contaminated dusts. Surface contaminants may also be leached or eroded by surface water runoff. Surface and subsurface contaminants may be leached to groundwater and transported in groundwater flow. These potential routes of migration were considered in development of exposure pathways in the baseline risk assessment. Migration by these pathways is discussed below.

Air

Surface contaminants may be suspended in air and transported by wind. Contaminant migration by this route can occur if contaminants are present in particle sizes small enough to be suspended and transported by wind. Data were collected during the RI to evaluate the potential for migration to occur by this route. Contaminated surface soil samples were collected and various size fractions analyzed to determine the level of contamination in the small fractions that could be eroded by the wind. These results show levels of contamination present in the smallest size fractions analyzed (i.e., less than 0.05 mm and 0.05 mm to 2.0 mm) are essentially the same as the levels in the bulk sample. Based on these results, contaminated dusts could be generated by winds strong enough to suspend these clay- to sand-sized particles.

Modeling to evaluate airborne transport of contaminants was performed as part of the baseline risk assessment. A box model was used to calculate concentrations of chemicals of concern in airborne dusts at on-site exposure points. These results were then used to determine the human health risk associated with airborne transport.

Surface Water

Surface contaminants may be transported in surface runoff from the Site. Contaminants may either be dissolved and transported in the liquid phase or contaminated particles may be eroded and suspended in runoff. Contaminant migration by this route can occur if runoff is present and if surface contaminants are either readily soluble or present in particle sizes small enough to be eroded. Data were collected during the RI to evaluate the potential for migration to occur by this route.

As described above, soil size fractions were analyzed to determine if contaminants were present in particle sizes which could be eroded. These results indicate that levels in easily erodible clay- to sand-sized fractions are essentially the same as in the bulk sample. In addition, samples were tested to see if contaminants could be leached into water. These results show that some of the chemicals of concern, notably arsenic, chromium, and copper, can be leached from contaminated soils at levels of concern.

The potential for runoff is affected by a number of factors including topography, vegetation, soil texture, and rainfall intensity. Topographic data were collected to evaluate the potential for runoff from the Site. These

data show that most of the contaminated areas are relatively flat, having slopes from 0.2 to 0.5 percent. Other site-specific factors are generally not indicative of a potential for high runoff. The Site is moderately vegetated with grasses and has coarse surface soils. These factors will reduce the potential for runoff. This qualitative evaluation of runoff potential is consistent with observations made at the Site. No erosion scars or other evidence of heavy runoff was noted.

The topographic data indicate that surfaces of all contaminated areas drain toward the creek that discharges from the JFP spring. The contaminant migration pathway for runoff, therefore, would include this creek and the Wallowa River. River sampling performed during the RI did not show any detectable contamination downstream of where the creek discharges to the Wallowa River.

Contaminant transport by surface water was not evaluated in the baseline risk assessment. Human exposure through groundwater pathways was determined to be greater than exposure through surface water pathways. For this reason, human exposure through surface water was not considered.

Groundwater

Surface and subsurface contaminants may potentially be transported in groundwater. Migration in groundwater is comprised of two phases, transport of contaminants from source areas to groundwater and transport of contaminants in groundwater. Factors affecting the first phase include the solubility of the contaminants and the ability of infiltrating water to contact and dissolve contaminants. As discussed above, chemicals of concern can be leached from contaminated soils and Site conditions are favorable for infiltration of precipitation. The combination of these factors indicates that contaminants can be leached from soil.

Factors affecting transport of contaminants in groundwater include geochemical interactions between contaminants and aquifer materials. Possible interactions were not specifically investigated during the RI. The overall effect of such interactions was investigated indirectly through analysis of groundwater samples for both total and dissolved metals. In general, these results show that total metals concentrations are much greater than dissolved metals concentrations. These results indicate that most of the metal contamination present in groundwater samples is associated with the solid phase rather than the liquid phase. The only results showing appreciable concentrations of dissolved contamination were from Well MW2, which is located downgradient of the treatment building. Some of the samples from Well MW2 contained dissolved arsenic and chromium at levels approximately equal to total levels.

Migration of contaminants in groundwater will also be affected by factors influencing the transport of the groundwater itself. Important factors affecting groundwater transport are the groundwater gradient and the hydraulic conductivity of the aquifer. Groundwater elevation data were collected during the RI and used to determine groundwater gradient. These results show a fairly uniform gradient of approximately 0.01 across the Site. Aquifer conductivity was evaluated during the SI and results show hydraulic conductivity values to range from 0.002 to 0.48 feet/min. The product of the gradient and conductivity yields flux values of 0.029 feet/day and 6.9

feet/day. The combination of gradient and conductivity suggests a substantial flow of groundwater at the Site. Mobile contaminants in groundwater would be readily transported from the Site.

Groundwater transport was not modeled in the baseline risk assessment. Exposure was evaluated using the measured concentrations of contaminants in groundwater on and off the Site.

Regulatory Requirements for Addressing Site Risks

The NCP, 40 C.F.R. Part 300, requires that the Site's remediation goals are protective of human health and the environment. Initially, contaminant concentrations are compared to existing criteria such as Safe Drinking Water Act Maximum Contaminant Level Goals (MCLGs) and Maximum Contaminant Levels (MCLs), State of Oregon cleanup levels under, and Clean Water Act Water Quality Criteria (WQC). However, there are no corresponding criteria for soils and structures. Federal remediation standards for soils and structures are usually established by setting contaminant concentrations for cancer-causing chemicals at levels that represent cancer risks between one-in-ten-thousand (10^{-4}) and one-in-one-million (10^{-6}). For toxic compounds not identified as carcinogens, the contaminant concentrations shall be protective of sensitive human subpopulations over a lifetime. Noncarcinogenic effects are expressed in terms of a "hazard index,".

VI. SUMMARY OF SITE RISKS

The risks to human health and the environment at the Site are described in the site-specific Human Health Risk Assessment, which was prepared by ICF Technology for EPA using EPA guidance. The Risk Assessment followed a four step process: 1) identification of contaminants which are of significant concern at the Site, 2) an exposure assessment which identified current and potential exposure pathways and exposure estimates, 3) toxicity assessments for the chemicals of potential concern at the Site, and 4) a risk characterization, which integrated the three earlier steps to summarize the potential and current risks posed by hazardous substances at the Site. The results of the Human Health Risk Assessment are discussed below.

Contaminants of Concern

Contaminants of concern were identified during the baseline risk assessment. Contaminants of concern were identified by comparing observed chemical concentrations with several criteria. These criteria were:

- Risk-Based Screening Levels (RBSLs). Maximum concentrations were compared to RBSLs developed by EPA for residential exposure scenarios. Chemicals with maximum concentrations above RBSLs were selected as chemicals of concern provided that they also met the other criteria.

- Allowable Daily Intake Levels. Maximum concentrations were compared with allowable daily intake levels for chemicals that are essential human nutrients. Chemicals were selected as chemicals of concern if toxicity and nutrient data suggested they are likely to be associated with adverse health effects.

- Naturally Occurring Background. Concentrations of inorganic compounds were compared with naturally occurring background levels. Chemicals were selected as chemicals of concern if a statistical test showed that the mean concentration of the chemical was significantly different than the background concentration of the chemical.

- Frequency of Detection. The frequency of detection was considered in selecting chemicals of concern.

Inorganic chemicals were evaluated using these criteria and seven chemicals were selected as chemicals of concern. These seven chemicals are arsenic, chromium, copper, lead, manganese, vanadium, and zinc. These chemicals could pose potentially significant risks of adverse health effects. Arsenic and chromium are considered carcinogens. Noncarcinogenic health effects which could result from exposure to the chemicals of concern include effects on the kidney, liver, cardiovascular, neurological and respiratory systems.

All organic chemicals detected on the Site were rejected as chemicals of concern. Organics were rejected because of a low frequency of detection or because concentrations were below RBSLs.

Exposure Assessment

The exposure assessment identified exposure pathways under current and future use scenarios. For each pathway being considered, concentrations of contaminants at points of exposure were determined. The results of the exposure assessment are described below.

Exposure Pathways

The exposure assessment identified exposure pathways under current and future use conditions. A variety of pathways were identified for consideration. These pathways were then evaluated and those that were incomplete were excluded from consideration. Complete pathways were further evaluated to select those to be included in the risk assessment. When pathways resulted in similar exposure, the pathway resulting in greater or more frequent exposure was selected. The following exposure scenarios and pathways were selected for conditions at the Site:

- Current-Use Worker Scenario: Exposure of workers via incidental ingestion of surface soils and inhalation of windblown dusts; and

- Current-Use Nearby Resident Scenario: Exposure of nearby residents via ingestion of groundwater.

- Future-Use On-Site Resident Scenario: Exposure of on-site residents via incidental ingestion of soils, inhalation of windblown dusts, and ingestion of groundwater.

Exposure Concentrations

Concentrations of chemicals of concern were determined for the points of

exposure for each of the scenarios and pathways. Reasonable maximum exposure concentrations were calculated at the 95 percent upper confidence limit of the arithmetic mean. For soil ingestion pathways, the concentrations were based on the results of analysis of surface soil samples. Separate exposure concentrations were developed for background areas, for each of the four storage areas, for the combined storage areas, and for the treatment building. For the current-use worker pathway, the background, combined storage area, and treatment building concentrations were used. For the future-use residential soil pathways, the background, individual storage area, and treatment building concentrations were used.

For inhalation pathways, the concentrations were based on the results of a box model that predicted concentrations of particulates in the air. Use of this model is described in the Risk Assessment Report. For the current-use worker pathway, a single maximum concentration for the entire Site was developed based on the results of analysis of surface soil samples around the treatment building. For the future-use on-site residential pathway, separate concentrations were developed for each of the storage areas and the treatment building.

Concentrations for groundwater pathways were based on the results of analysis of total metals in samples from the monitoring wells. For the current-use nearby resident pathway, results from the on-site and off-site wells around the nearest downgradient residence (i.e., Wells MW4, MW5, and MW6) were used. Average (average of three wells) and reasonable maximum case (highest well) concentrations were developed. For the future-use on-site resident pathway, results for the on-site wells (i.e., Wells MW1, MW2, MW3, and MW4) were used. Average and reasonable maximum case concentrations were developed.

The exposure point concentrations were used to estimate chronic daily intakes (CDIs) for each of the chemicals of concern for each pathway. Exposure factors were developed based on EPA's Risk Assessment Guidance for Superfund Manual and the EPA Region 10 Supplemental Risk Assessment Guidance for Superfund Document.

Toxicity Assessment

Toxicity data for each of the chemicals of concern were collected from EPA's Integrated Risk Information System (IRIS) or from EPA's Health Effects Assessment Summary Tables (HEAST). Toxicity data for noncarcinogens were used to develop chronic reference doses (RfDs) for ingestion and inhalation routes of exposure. As necessary, uncertainty factors were assigned to account for uncertainty in the data used. Published toxicity data were also used to identify cancer slope factors (SFs) for carcinogens for ingestion and inhalation routes of exposure.

Risk Characterization

In the risk characterization, CDIs developed during the exposure assessment were compared with RfDs and SFs identified during the toxicity assessment. This assessment of risk was performed for each of the chemicals of concern for each of the exposure pathways. For noncarcinogens, the quotients of the CDI and RfD were summed to develop a hazard index (HI) for each pathway. Similarly, chronic daily intakes and SFs were used to determine

the excess cancer risk for each pathway. As described above, exposure concentrations for different locations were considered for some pathways. The exposure at the treatment building location is based on conditions existing before the removal action. For pathways involving adult residents, both average and reasonable maximum exposure (RME) concentrations were considered. The results of the risk characterization are summarized in Table 9.

As can be seen from Table 9, the risk characterization results show an HI greater than 1.0 and excess cancer risk greater than 10^{-6} for all soil and water ingestion pathways. All inhalation pathways have an HI less than 1.0 and excess cancer risk less than 10^{-6}. These results indicate current and potential future risk associated with Site conditions.

The detailed results of the risk assessment show that in almost every case, the noncarcinogenic risk is due to exposure to arsenic. There were limited instances where the quotient of CDI and RfD exceeded 1.0 for contaminants other than arsenic. These cases are:

- Current-use nearby child resident, ingestion of water -- exposure to hexavalent chromium and vanadium result in CDI/RfD equal to 1.06 and 2.18, respectively;
- Future-use on-site child resident, ingestion of soil -- RME exposure to hexavalent chromium at treatment building results in CDI/RfD equal to 3.30.

In all ingestion pathways, the excess cancer risk is due entirely to arsenic.

Ecological Assessment

The baseline risk assessment also included an environmental assessment to identify potential impacts to non-human receptors exposed to chemicals of concern. This assessment included identification potential receptors, determination of exposure pathways and exposure point concentrations, assessment of the environmental toxicity of chemicals of concern, and assessment of impacts to environmental populations.

The potential risks to aquatic life were assessed by comparing concentrations of chemicals of concern in groundwater and surface water with lowest observed effect levels (LOELs) for aquatic organisms. Groundwater concentrations were considered because of the potential for discharge of contaminated groundwater to surface water bodies. None of the observed surface water concentrations exceeded LOELs. Observed levels of total arsenic, chromium, copper, lead, and zinc in groundwater were above LOELs. This situation indicates a future potential risk associated with discharge of contaminated groundwater.

The potential risks to vegetation, mammals, and birds were assessed qualitatively because of the limited toxicity data available. The assessment identified potential phytotoxic effects to vegetation due to high concentrations of chemicals of concern in soils. Wildlife may be exposed to contaminated soil, vegetation, or water at the Site, though this exposure was expected to be intermittent.

Exposure Assessment Uncertainties

Uncertainties in the exposure assessment can arise from use of sampling and analysis data, from assumptions concerning exposure scenarios, and from use of fate and transport modeling. Uncertainty from the use of soil sampling and analysis data depends on how well the samples collected characterize the Site. Most of the samples were collected in areas that information from the SI and the history of Site operations indicated were contaminated. These areas represent a relatively small portion of the total Site area. The remainder of the Site is represented by a small number of background samples. Use of background samples in this way could potentially underestimate risk if there other areas of contamination not previously identified. However, based on the extensive sampling during the SI, the results of the SI and RI, field observations and information about the history of Site operations, it is unlikely that such areas exist.

Uncertainty from the use of groundwater sampling and analysis data results from the use of total rather than dissolved concentrations. As discussed previously, most of the metals present in groundwater appear to be associated with particulate matter in the groundwater samples. If groundwater samples had a higher turbidity than would be used as drinking water, the risks from groundwater ingestion may be overestimated.

For the exposure pathways considered, there are uncertainties in the number and length of times individuals would come into contact with the contaminants. Two exposure cases were generally considered, the average and the reasonable maximum. The reasonable maximum exposure assumptions are intended to place a reasonable upperbound on the estimate of potential risks. Upperbound risks are unlikely to underestimate and very probably overestimate the actual risks.

A fate and transport model was used to estimate concentrations of chemicals of concern in airborne dusts at the Site. This approach was taken because there were no data on measured concentrations of airborne contaminants. In applying the model, conservative assumptions were made concerning the parameters used in the model. These conservative assumptions likely overestimate the exposure point concentrations in windblown dusts, which in turn, may overestimate the risk associated with inhalation of windblown dusts.

Toxicity Assessment Uncertainties

Uncertainties in the toxicity assessment can arise from use of results of animal studies, identification of chemical species, and evaluation of mixtures of chemicals. Use of animal study data involves application of conservative assumptions in establishing values for RfDs and cancer potency factors. This approach is likely to err on the side of overestimating rather than underestimating health risks.

In identifying chemical species for collection of toxicity data, it was assumed that all chromium at the Site exists in the form of hexavalent chromium. There are different toxicities with different chromium species and hexavalent chromium is the most toxic form. Because it is unlikely that all of the chromium at the Site is hexavalent, this approach is likely to overestimate risks.

There is uncertainty in assessing the toxicity of mixtures of chemicals. There were no data characterizing the effects of chemical mixtures similar to those found at the JFP Site. As a result, the chemicals at the Site were assumed to act additively and potential health risks were calculated by summing excess cancer risks and hazard ratios for individual chemicals.

Risk Characterization Uncertainties

Uncertainties in risk characterization result in compounding individual uncertainties from the exposure assessment and toxicity assessment. For example, if a CDI for a contaminant is combined with a cancer potency factor to determine potential health risks, the uncertainties on the concentration measurements, exposure assumptions, and the toxicities will all be expressed in the result.

Conclusions for Human Health Risk Assessment

The human health risk assessment indicates a potential risk of exposure by ingestion of soil and groundwater under current and future use scenarios. The greatest potential risk at the Site is due to carcinogenic and noncarcinogenic effects from ingestion of contaminated soils. Site workers and future Site residents are at risk. Arsenic is the contaminant posing the greatest health risk.

An additional potential risk posed by the Site is carcinogenic and noncarcinogenic effects from ingestion of contaminated groundwater. Current off-site residents and future on-site residents are at risk. Arsenic is the contaminant posing the greatest potential health risk.

Although not quantitatively addressed in the risk assessment, surface contamination on equipment and structures may also pose a risk from the ingestion pathway. In addition, the RI identified several other areas at the Site where cleanup activities should be implemented. These activities are:

- Removal of asbestos-containing material (ACM) from the former lumber drying building; and

- Decommissioning of two abandoned underground storage tanks (USTs).

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VII. DESCRIPTION OF ALTERNATIVES

Remedial Action Objectives and Goals

Remedial action objectives (RAOs) which describe in general terms what any remedial action needs to accomplish in order to be protective of human health and the environment were established for each contaminated medium at the Site. They specify the contaminants and environmental media of concern, the potential exposure pathways to be addressed by remedial actions, the exposed populations and environmental receptors to be protected, and acceptable contaminant concentrations (or concentration ranges) in each

contaminated medium. The acceptable exposure concentrations are known as remediation goals. Remedial action objectives and remediation goals are described in the NCP, 40 C.F.R. 300.430(e)(2)(i).

Remediation goals are a subset of remedial action objectives. They provide numerical goals for remedial actions to meet. Initially, Preliminary remediation goals (PRGs) are developed and used as a basis for evaluating cleanup alternatives. Final remediation goals are determined when the remedy is selected. PRGs for the JFP Site were established for pathways and chemicals of concern identified in the baseline risk assessment. PRGs were compared to existing levels of contamination on the Site to determine the contaminants to be addressed by the RAOs. The PRGs were also used to identify specific criteria (e.g., contaminant levels) to determine when objectives have been met.

Based on the pathways and contaminants of concern identified in the baseline risk assessment, PRGs were developed for soil and groundwater contaminants considering exposure via ingestion. PRGs for soil and groundwater were developed using the guidance specified in "EPA Region 10 Supplemental Risk Assessment Guidance for Superfund" (EPA 1991).

Development of PRGs considered risk-based concentrations, as well as Applicable or Relevant and Appropriate Requirements (ARARs). Risk based concentrations were developed for target risks of 10^{-6} and 10^{-4} for carcinogens and a hazard quotient of 1.0 for noncarcinogens. Both residential and industrial exposure conditions were considered.

No ARARs were identified for soil cleanup levels. ARARs for groundwater are maximum contaminant levels (MCLs) under the federal Safe Drinking Water Act. No ARARs were identified specifying cleanup levels for contaminated surfaces.

PRGs for groundwater and soil are presented in Tables 10 and 11, respectively.

The RAOs for groundwater are to prevent ingestion of arsenic and chromium in excess of MCLs. These objectives will be met if the concentrations of arsenic and chromium are below the MCLs in all groundwater at the Site. The remaining contaminants of concern (copper, lead, manganese, vanadium, and zinc) are not addressed in the RAOs based on the results from the RI, as described below.

All groundwater sampling results for total and dissolved copper and zinc were present below all PRGs. All results for total and dissolved lead were below the MCL and only three total lead results, all from the first round of sampling, were above 15 ug/L. All manganese results were below both risk-based PRGs. Many total manganese results were above the secondary MCL, while dissolved manganese results were all below the secondary MCL and generally below detection. Total manganese in groundwater appears to be naturally occurring and unrelated to Site activities. Only two total vanadium results were present at slightly above the residential risk-based PRG.

The RAOs for soil consider ingestion as well as protection of groundwater from migration of soil contaminants. The RAOs for soil ingestion are to prevent ingestion of chromium and copper in excess of the reference

dose and to prevent ingestion of arsenic causing an excess cancer risk greater than 10^{-4} to 10^{-6}. These objectives will be met if conditions on site are such that the concentration of arsenic is equal to or less than the risk-based PRGs.

The RAOs for chromium and copper in soil will be met through cleanup to meet the risk-based PRGs for arsenic. This approach will be effective because soil samples collected following the removal action indicated that residential risk-based PRGs for chromium (VI) and copper were only exceeded beneath the treatment building. These samples also had the highest levels of arsenic.

The remaining contaminants of concern (lead, manganese, vanadium, and zinc) are not addressed in the RAOs for soil ingestion based on the results from the RI. Following the removal action, the results from all but two sample locations were below the residential risk-based PRGs for lead. All results for manganese, vanadium, and zinc were below risk-based PRGs.

The soil RAOs for groundwater protection are to prevent migration of arsenic and chromium from soil resulting in groundwater concentrations above MCLs. The results of the RI indicate that migration of contaminants to groundwater is not presently of concern because arsenic and chromium are below MCLs. As with the groundwater objectives, the soil RAOs for groundwater protection will be met if the concentrations of arsenic and chromium are below the MCLs in all groundwater at the Site.

The RAOs for contaminated structures and equipment are to prevent ingestion of chromium and copper in excess of the reference dose and to prevent ingestion of arsenic causing an excess cancer risk greater than 10^{-4} to 10^{-6}. These objectives will be met if surfaces are decontaminated so that contaminants are no longer extractable.

RAOs were also identified for the asbestos material and underground storage tanks identified at the Site. These RAOs are to remove all ACM from the abandoned drying building and to abandon the USTs in compliance with Oregon DEQ regulations for petroleum UST abandonment.

Preliminary alternatives were developed and evaluated against the RAOs and PRGs. Alternatives that met the RAOs and PRGs were then considered for detailed analysis. A summary of the alternatives developed and evaluated are described below. A summary of the actions under each alternative is shown in Table 12.

Alternative 1 - No Action

Alternative 1 in the FS is the No Action Alternative. Under this alternative, no action would be taken to remove or treat any contamination at the Site. The alternative would include groundwater monitoring and maintenance of existing security fencing. Monitoring would include biannual monitoring of groundwater at and near the Site using the existing network of monitoring wells. In addition, samples would be collected from the spring on the JFP Site and from the two City of Enterprise springs. The wells and springs would be sampled on a biannual basis and samples analyzed for total and dissolved metals. Monitoring would also include inspection of the Site to verify that there has been no contact with contaminated soils or structures and that the existing access control fences are in good repair. These

inspections would be performed biannually in conjunction with the water sampling. If necessary, repairs to the fences would be made.

Operation and maintenance (O&M) activities for this alternative would include biannual sampling and analysis of groundwater and the City water supply Springs and inspection of the Site for a minimum of 2 years.

The cost of the no-action alternative consists of the costs associated with continued biannual groundwater monitoring and inspections. There is no capital cost associated with these activities. The estimated cost for two sampling events per year, including collection of samples, analysis for total and dissolved metals, validation, and reporting is $24,000.

Action Alternatives - Common Elements

All of the action alternatives, alternatives 2 through 6, have common elements. These include demolition of the treatment building, excavation of contaminated soil and debris, removal of asbestos and underground tanks, and decontamination of process equipment. Operation and maintenance (O & M) would include biannual monitoring of the existing wells and the City springs for a minimum of 2 years and up to 5 years, except for Alternative 3 which would include biannual monitoring for a minimum of 5 years.

A summary of the area and volumes of soil to be excavated for the different alternatives is shown on Table 13.

Alternative 2 - Cleanup to Background With Off-Site Disposal of All Soils and Debris

Alternative 2 consists of demolishing the treatment building and drip pad, excavating all surface and subsurface soil contaminated above background for all chemicals of concern, transporting all soil and debris off-site to a disposal facility, removing ACM from the wood drying building, and removing the two inactive USTs.

The major portion of this alternative consists of demolishing the treatment building and drip pad and excavating soils from beneath the building and pad. Large equipment within the building, including the retort vessel and steel tanks, would be dismantled and removed from the building. If necessary for access by lifting equipment, the roof of the building would be removed. The wooden structure would then be razed and the wooden debris collected (ie, into 20- or 30-cubic yard roll-off boxes). Next, the concrete floor and drip pad would be demolished and the concrete debris collected for transport off the Site. With the floor and pad removed, contaminated soil would then be excavated and placed in dump trucks for off-site transport. As soils are excavated, samples would be collected from the excavation pit and analyzed using field screening techniques to determine whether the cleanup level had been reached and whether soils exceed hazardous waste designation levels. Excavated soils would be stockpiled on site. Confirmation samples would be collected for laboratory analysis to verify that cleanup goals had been met. After receipt of confirmation sample data, the excavation would then be backfilled with clean soil. Once all contaminated soils and debris had been disposed, equipment used to demolish the building and excavate and move the soil would be decontaminated.

Soils exceeding hazardous waste levels would be segregated from those which do not. Hazardous waste would be transported to a RCRA permitted disposal facility for disposal. Hazardous waste would be treated by solidification, if required to meet requirements for land disposal, prior to disposal in a RCRA landfill. Contaminated soil or debris which is not classified as hazardous waste may be disposed in a permitted solid waste disposal facility

This alternative also involves removal of ACM from the abandoned wood drying building. ACM removal would involve wetting the ACM fabric with a water-surfactant mix, removing it from the walls, and placing it into sealable plastic bags. After all materials had been removed, the wall surfaces would be vacuumed. Asbestos-containing wastes would be disposed of off-site in a trench meeting regulatory requirements for asbestos waste disposal.

This alternative also includes removal of the two abandoned USTs. Tank removal activities would include excavation of soil from around the tanks, removal of the tanks from the ground, decontamination of the tanks if any residuals are present, and transport of the tanks off-site for disposal or salvage as scrap metal. Soil samples would be collected from beneath the tanks and analyzed for total petroleum hydrocarbons as required by DEQ tank closure regulations. If soil contamination is discovered, contaminated soil would be excavated and disposed of off-site. The excavation would be backfilled with clean soil. DEQ soil cleanup standards for petroleum would be used to define the extent of soil requiring cleanup.

O&M activities for this alternative would be limited to periodic groundwater monitoring. Existing wells and springs would be sampled biannually and samples analyzed for total and dissolved metals. Monitoring would continue for a minimum of two years and may be continued up to five years if determined to be necessary based on evaluation of the results.

The total estimated capital cost of this alternative is $1,540,000. The estimated O&M costs for monitoring are $24,000 per year. This alternative would take 3 to 6 months to complete.

Alternative 3 - Cleanup to Background With Treatment and On-Site Disposal of Soils and Debris

Alternative 3 is very similar to Alternative 2 except that soils would be treated and disposed of on-site and the concrete and steel surfaces of the treatment building and drip pad would be decontaminated by gritblasting or similar method before demolition. Contaminated grit would be collected for off-site disposal as hazardous waste. After decontamination, the structures would be demolished as described for Alternative 2. Decontaminated steel would be sent off-site for reuse or recycling. Decontaminated concrete debris would be disposed of on-site. Because wood cannot be easily decontaminated, wood debris would be sent off-site for disposal.

The technique employed to treat excavated/stockpiled soils would involve use of a mobile treatment unit. The specific treatment process would stabilize the chemicals of concern arsenic, chromium, and copper. Before this alternative could be implemented, additional testing would be required. The treatment process would have to treat arsenic, chromium, and copper so that the treated soil posed no more risk than background soils. Treated soil would

be used to backfill excavations to within one foot of grade. One foot of clean topsoil would then be placed over the treated soil. A trench would be excavated on-site to dispose of excess treated soil as well as the decontaminated debris. Excess excavation spoils would be taken off-site for use or spread on-site.

The removal of ACM from the abandoned wood drying building and removal of the inactive USTs would be performed as described for Alternative 2.

This alternative also includes the use of institutional controls such as deed restrictions, or use of an environmental notice to ensure appropriate consideration of Site conditions in future land use decisions. The use of such measures will be dependent on the conditions at the site at the completion of the cleanup. Environmental notice would provide potential purchasers with notification of the types of uses that would be consistent with the level of cleanup achieved.

O&M activities for this alternative would be limited to periodic groundwater monitoring and inspection of the on-site disposal areas. Existing wells and springs would be sampled biannually and samples analyzed for total and dissolved metals. In addition, new wells would be installed as necessary to monitor migration from the disposal areas. Disposal areas would be inspected to determine if cover soil was in place and would be repaired as necessary.

The total estimated capital cost of this alternative is $1,890,000. The estimated O&M costs for monitoring and inspection are $24,000 per year. This alternative would take approximately 18 months to implement, including time required for treatability studies. Groundwater monitoring would be conducted for a minimum of 5 years.

Alternative 4 - Surface Soil Cleanup to Residential PRG With Off-Site Disposal of All Soils and Debris

Alternative 4 is identical to Alternative 2 except for the cleanup levels used and the handling of the drip pad. For Alternative 4, all surface soils, including the perimeter of the drip pad and the storage areas, would be excavated until arsenic levels meet the 10^{-5} industrial PRG of 36 mg/kg (approximately equal to 10^{-4} residential PRG). Subsurface soil (i.e., deeper than three feet) would be cleaned to meet the arsenic 10^{-4} industrial PRG of 336 mg/kg. Contaminated soil under the drip pad meets the 10^{-4} industrial PRG and therefore would remain in place. A more stringent cleanup level would be applied to surface soil because this is where the greatest potential for human contact exists. This cleanup strategy would allow industrial reuse of the treatment building area and residential use of the remainder of the Site.

As with Alternative 2, this alternative consists of demolishing the treatment building, transporting all soil and debris off-site to a disposal facility, removing ACM from the wood drying building, and removing the two inactive USTs.

An important difference to note between Alternative 4 and Alternative 2 is that the drip pad would not be demolished. Instead, the exterior surfaces of the drip pad would be decontaminated by gritblasting or similar method. Treatment equipment would be decontaminated as described for Alternative 3 to

allow recycling of metal.

Use of institutional controls or environmental notice would be as described for Alternative 3. O&M activities for this alternative would be as described in Alternative 2.

The total estimated capital cost of this alternative is $550,000. The estimated O&M costs for monitoring and inspection are $24,000 per year. It is estimated that this alternative could be completed within 3 to 6 months. Groundwater monitoring would be conducted for a minimum of 2 years and up to 5 years.

Alternative 5 - Surface Soil Cleanup to Residential PRG with Treatment and On-Site Disposal of Soils and Debris

Alternative 5 is similar to Alternative 3 except that a soil washing treatment technology would be used to treat excavated soils, and the soil cleanup levels and handling of the drip pad would be as described in Alternative 4. The soil washing treatment process would generate contaminated residuals that would be disposed off-site at a RCRA permitted disposal facility.

Before this alternative could be implemented, additional testing would be required to establish the proper treatment chemicals and conditions for soil washing.

ACM from the abandoned wood drying building and removal of the inactive USTs would be performed as described for Alternative 2. Use of institutional controls or environmental notice would be as described for Alternative 3.

O&M activities for this alternative would be similar to those for Alternatives 4 and 5 and would involve periodic groundwater monitoring and inspection of the on-site disposal areas. As with Alternative 3, new wells would be installed as necessary to monitor migration from the disposal areas.

The total estimated capital cost of this alternative is $1,470,000. The estimated O&M costs for monitoring and inspection are $24,000 per year. It is estimated that this alternative would take up to 18 months to implement, including time for treatability studies. Groundwater monitoring would be conducted for a minimum of 2 years and up to 5 years.

Alternative 6 - Cleanup to Industrial PRG With Off-Site Disposal of All Soils and Debris

Alternative 6 is similar to Alternative 4 except that both the surface soils and the subsurface soils would be remediated to the 336 mg/kg industrial cleanup level. The only identified area of soil above the industrial PRG is the soil beneath the treatment building. The soil and demolition debris would be disposed of off-Site, as described for Alternative 2. Because the soil beneath the drip pad is not contaminated above the industrial PRG, the drip pad would not be demolished. Instead, the surface of the drip pad would be decontaminated, as described for Alternatives 4 and 5 and the drip pad left in place. Treatment equipment would be decontaminated for recycling, as described for Alternatives 4 and 5.

Asbestos and UST removal would be as described for the other alternatives. Use of institutional controls or environmental notice would be as described for Alternative 3.

O&M activities for this alternative would be limited to biannual monitoring of existing wells and springs.

The total estimated capital cost of this alternative is $210,000. The estimated O&M costs for monitoring and inspection are $24,000 per year. It is estimated that this alternative could be completed in less than six months.

Summary of Comparative Analysis of Alternatives

Based on a screening with respect to effectiveness, implementability, and cost, all alternatives except Alternative 3 were selected for detailed analysis. Alternative 3 was considered less effective than the other on-site treatment alternative, Alternative 5, and there are Agency and community concerns about leaving solidified contaminated material on-site that would be subject to freeze/thaw cycles and would be located in a watershed protection area.

The detailed comparative analysis of the five remaining alternatives with respect to the nine criteria specified in the NCP is described below. These criteria are presented in three categories, threshold criteria, primary balancing criteria, and modifying criteria.

A. Threshold Criteria

The remedial alternatives were first evaluated in relation to the threshold criteria: overall protection of human health and the environment, and compliance with ARARs. The threshold criteria are statutory requirements and must be met by all alternatives that remain for final consideration as remedies for the Site.

1. Overall Protection of Human Health and the Environment. This criteria addresses whether or not a remedial alternative provides adequate protection and describes how risks are eliminated, reduced, or controlled through treatment and engineering or institutional controls.

Alternative 1, the no action alternative, provides no protection beyond the existing baseline and is not considered protective of human health and the environment. The no action alternative is not carried forward for further evaluation.

All the action alternatives, Alternatives 2 through 6, would provide acceptable protection of human health and the environment. As designed, each alternative would generally provide protection by removing all contamination above cleanup levels from the Site. Cleanup levels were established for all action alternatives so as to be within EPA acceptable risk range of 10^{-4} to 10^{-6}. With Alternative 2, all materials contaminated above cleanup levels would be disposed of off-site at permitted/approved disposal facilities. With the remaining action alternatives, all materials except the drip pad would be disposed off-site. Under these alternatives, the drip pad would be

decontaminated and remain on site. All the action alternatives provide for immediate protection by removing potential sources of contamination from the Site. All four action alternatives should be effective in meeting cleanup levels; the cleanup levels used for each of the alternatives are different, however. The effectiveness of Alternative 5 is less certain than Alternatives 2, 4, and 6 because it includes unproven treatment technology.

2. **Compliance with ARARs.** This criteria addresses whether or not a remedial alternative will meet all ARARs or provide grounds for invoking a waiver. See Section X of this ROD for a discussion of specific ARARs considered in this analysis.

It is currently expected that all four action alternatives would be equally effective in complying with ARARs. The alternatives have various action-specific ARARs related to hazardous waste generation, transportation, treatment, and disposal; asbestos removal and disposal; and UST removal. It is expected that these ARARs would be met, though several specific requirements are presently uncertain. It is not known whether action-specific ARARs would apply to gritblasting and soil washing as hazardous waste treatment. It is expected that these ARARs would address preventing contaminant releases and could be met through proper design and operation of treatment processes.

B. Primary Balancing Criteria

Once an alternative satisfies the threshold criteria, five primary balancing criteria are used to evaluate the technical and engineering aspects of the remedial alternatives.

3. **Long-Term Effectiveness and Permanence.** This criteria refers to the ability of a remedial alternative to maintain reliable protection of human health and the environment once remediation goals have been achieved. The magnitude of residual risk is considered as well as the adequacy and reliability of controls.

Alternatives 2, 4, and 6 would be very similar in meeting the criterion for long-term effectiveness and permanence. These alternatives include removal and off-site disposal of contaminants present above cleanup levels. The alternatives, however, result in different residual on-site risks because different cleanup levels are used. Alternative 2 results in the lowest risk, followed by Alternative 4, then Alternative 6. The effectiveness of Alternative 5 depends more on controls than the effectiveness of the other alternatives. Alternative 5 involves on-site disposal and relies on the use of treatment technologies to separate contaminants for off-site disposal. Because of less reliance on controls, Alternatives 2 and 4 are rated highest in meeting this criterion, followed by Alternative 6, then Alternative 5.

Off-site risk would be controlled through the methods of disposal used for contaminated residuals. Alternatives 2, 4, and 6 would use the same methods of disposal and would result in similar off-site risks. The volumes of materials disposed off-site would vary with the alternatives, but all would result in off-site disposal of the most highly contaminated material.

4. Reduction of Toxicity, Mobility, or Volume. This criteria refers to

the anticipated performance of treatment technologies which will be used in the various remedial alternatives, such as solidification and incineration, etc.

Alternative 5 provides the greatest reduction of toxicity, mobility, and volume through treatment. This alternative employs the use of soil washing to reduce the volume of contaminated material that must be disposed of off-site. Alternatives 4 and 6 are rated equal with respect to this criterion because both use they do not use treatment other than off-site treatment of hazardous residuals to meet Land Disposal Restrictions (LDR) treatment standards (if necessary) under the Resource Conservation and Recovery Act (RCRA).

5. Short-term Effectiveness. This criteria refers to the period of time needed to achieve protection, and any adverse impacts on human health and the environment, specifically site workers and community residents, that may be posed during the construction and implementation period until cleanup goals are achieved.

Alternative 6 would result in the least threat to the community and workers during implementation because it would involve the least amount of contaminated materials handling and treatment. Alternative 4 carries a slightly greater short-term risk because of the increased volumes of soil. Alternative 5 would involve even greater risk to workers because of the potential for contaminant releases during soil washing and concrete gritblasting. Alternative 2 does not include soil washing or gritblasting, but does involve handling the greatest volume of material and highest risks associated with transport of the contaminated soil to an off-site disposal facility.

6. Implementability. This criteria refers to the technical and administrative feasibility of a remedial alternative, including the availability of goods and services needed to implement the selected remedy.

Alternatives 4 and 6 are the most implementable of the action alternatives because they involve standard construction techniques which were already used during the removal action (with the exception of the drip pad and equipment decontamination). Alternative 2 involves standard construction techniques; however, it is less implementable because it involves cleanup to background levels, which will be difficult to achieve because of the levels which exist naturally on site. Alternative 5 is the least implementable alternative because of the use of soil washing, an unproven treatment technology requiring performance of treatability tests. Alternatives 2, 4, 5, and 6 would share similar implementability concerns with respect to off-site disposal of residuals.

7. Cost. This criteria refers to the cost of implementing a remedial alternative, including operation and maintenance costs.

All of the alternatives have the same O&M costs. For the off-site disposal alternatives, costs decrease with increasing cleanup levels. Alternative 6 has the lowest cost, followed by Alternative 4 and Alternative 2. Alternative 5, the on-site treatment and disposal alternative, has a much higher capital cost than Alternative 4, the off-site disposal alternative for the same cleanup level.

C. Modifying Criteria

Modifying criteria are used in the final evaluation of the remedial alternatives after the formal comment period, and may be used to modify the preferred alternative that was discussed in the Proposed Plan.

8. State Acceptance. This criteria refers to whether the state agrees with the preferred remedial alternative.

DEQ concurred with the selection of the preferred remedial alternative as presented in the proposed plan. DEQ has been involved with the development and review of the RI/FS, the Proposed Plan, and this ROD.

9. Community Acceptance. This criteria refers to the public support of a given remedial alternative.

No written comments were received during the public comment period on the Proposed Plan. Prior to the removal action conducted last fall, the City of Enterprise submitted a letter to EPA that supported off-site disposal of contaminated material from the JFP Site. Off-site disposal is included in the selected remedy.

IX. THE SELECTED REMEDY

The selected remedy as described in Alternative 4 is excavation and off-site treatment (if necessary) and disposal of soils, decontamination of debris, and off-site disposal of debris. The selected remedy also includes institutional controls for contaminants remaining on site and monitoring of on-site groundwater to ensure that concentrations remain below health based levels of concern.

The selected remedy is protective of human health and the environment, complies with state and federal laws, and is cost effective. It utilizes readily available technology for treatment and disposal of soils to prevent groundwater contamination. Promulgated state rules and regulations which are more stringent than federal requirements are included as ARARs.

Major Components of the Selected Remedy

The selected remedy involves excavation of contaminated surface and subsurface soils to meet risk-based cleanup levels, demolition of the treatment building, decontamination of the drip pad and treatment equipment, and off-site disposal of soils and decontaminated debris. This alternative also includes UST removal, asbestos removal, and groundwater monitoring.

The first major activity in implementation of the alternative shall be demolition of the contaminated structures. The contaminated process equipment, including the retort, storage and mixing tanks, and pumps shall be removed from the treatment building. If necessary, the retort and tanks shall be cut into small sections with a cutting torch. The wooden structure shall then be razed, and wooden debris shall be collected into roll-off boxes for off-site transport. Next, the concrete floor shall be demolished and concrete debris shall be stockpiled for off-site transport in dump trucks.

The concrete drip pad shall be decontaminated to prevent exposure via direct contact. The steel treatment equipment, including the retort and tanks, shall be decontaminated by pressure washing, gritblasting, or an equivalent method. Decontamination metal shall be recycled, if possible, or disposed off site.

Contaminated soil shall be excavated and placed in dump trucks for off-site transport. As soils are excavated, samples shall be collected for field screening and laboratory verification analysis to determine whether the cleanup level had been reached and whether soils exceed hazardous waste designation levels. Soils exceeding hazardous waste levels shall be segregated from those which do not. After receipt of verification sample data, the excavation shall then be backfilled to grade with clean soil hauled in from off-site. Hazardous waste shall be transported to a RCRA permitted disposal facility for disposal. Hazardous waste shall be treated by solidification, if required to meet requirements for land disposal, prior to disposal in a RCRA landfill. Contaminated soil or debris which is not classified as hazardous waste may be disposed in a permitted solid waste disposal facility.

ACM shall be removed from the abandoned wood drying building. ACM removal will involve wetting the ACM fabric with a water-surfactant mix, removing it from the walls, and placing it into sealable plastic bags. After all materials had been removed, the wall surfaces shall be vacuumed. Asbestos-containing wastes would be disposed of off-site in a trench meeting federal Clean Air Act requirements for asbestos waste disposal.

This alternative also includes removal of the two abandoned USTs. Tank removal activities shall include excavation of soil from around the tanks, removal of the tanks from the ground, decontamination of the tanks if any residuals are present, and transport of the tanks off-site for disposal or salvage as scrap metal. Soil samples shall be collected from beneath the tanks and analyzed for total petroleum hydrocarbons (TPH) as required by DEQ tank closure regulations. If soil contamination is discovered, contaminated soil shall be excavated and disposed of off-site. Soil shall be removed to meet DEQ soil matrix cleanup levels for TPH. The excavation shall be backfilled to grade with clean soil.

During all demolition and excavation activities, air monitoring shall be performed to verify that dust generation is below acceptable levels as specified in the health and safety plan for the remedial action. If dust generation becomes a problem, mitigative measures specified in the health and safety plan shall be implemented.

All demolition, excavation, and waste handling equipment shall be decontaminated before leaving the Site. Decontamination wastes shall be collected for analysis and appropriate disposal.

O&M activities for this alternative shall be limited to periodic groundwater monitoring. The existing monitoring network of wells and springs shall be sampled biannually for a period of two years following completion of the remedial action. Samples shall be analyzed for total and dissolved metals. After two years, monitoring results shall be evaluated to determine whether monitoring shall be continued.

Final Remediation Goals

Final remediation goals were selected based on the PRGs previously described and the results of the alternatives analysis. Table 14 shows the final remediation goals for the JFP Site. All surface soils shall be excavated to depth until arsenic concentrations meet the 10^{-5} remediation goal of 36 mg/kg for industrial use. Soils beneath the treatment building shall be shall to excavated to meet the 10^{-4} remediation goal of 336 mg/kg for industrial use. EPA has selected the more stringent cleanup level for surface soil because this is where the greatest potential for human contact exists and it will also allow residential use. Because the 10^{-5} industrial remediation goal for surface soils is approximately equal to the 10^{-4} residential cleanup level, this strategy will allow residential use of all portions of the site except the treatment building area. Based on the results from the removal action, cleanup of soil to the selected arsenic cleanup levels will also achieve chromium and copper cleanup levels of 1,351 mg/kg and 10,000 mg/kg, respectively, associated with hazard index of 1. The selected remedy should meet the final remediation goals.

The State of Oregon cleanup standard is to clean up to background levels if possible, or if not, to a level that is protective of human health and the environment. Background arsenic levels near the JFP site were measured in the range of 4 to 11 mg/kg. EPA's cleanup goal of 36 mg/kg for surface soil will be close to, but slightly higher than, measured background levels. It is EPA's judgment that the marginal increase in protection provided by cleaning up to background levels does not justify the additional remediation effort and costs.

Groundwater monitoring results will be used to verify that arsenic and chromium levels remain below the MCL.

X. STATUTORY DETERMINATION

The procedures and standards for responding to release of hazardous substances, pollutants and contaminants at the Site shall be in accordance with CERCLA, as amended by SARA, and to the maximum extent practicable, the NCP, 40 C.F.R. Part 300 (1990), promulgated in the Federal Register on March 8, 1990.

EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA, 42 U.S.C. 9621,establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with applicable or relevant and appropriate environmental standards established under federal laws and promulgated state laws, unless a statutory waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a statutory preference for remedies that permanently and significantly reduce the volume, toxicity or mobility of hazardous substances over remedies that do not achieve such results through treatment. Remedial alternatives at the Site were developed to the maximum extent practicable to be consistent with these statutory requirements and preferences.

The selected remedy meets statutory requirements of CERCLA, as amended by SARA, and to the maximum extent practicable, the NCP. The evaluation criteria are discussed below.

A. Protection of Human Health and the Environment

The selected remedy will provide long-term protection of human health and the environment by removing the contaminated soil and eliminating it as a potential source of groundwater contamination. These measures will also eliminate the exposure routes of inhalation and ingestion of contaminated soil particles, dermal contact with contaminated soil, and ingestion of contaminated groundwater.

No unacceptable short-term risks or cross-media impacts will be caused by implementation of the remedy. Soil excavation and debris decontamination could involve short-term exposure through inhalation of contaminated soil particles by Site workers and nearby residents and dermal contact with contaminated soils by Site workers. These exposures can be eliminated through the use of air monitoring and proper dust control measures during remedial activities, and by implementing a strict site-specific health and safety plan. Short-term risks associated with transportation of contaminated material shall be controlled by using liners and covers, decontaminating trucks before they leave the Site, and compliance with Department of Transportation requirements.

Institutional controls and/or environmental notice will also assist in controlling land uses.

B. Compliance with ARARs

The selected remedy will comply with all ARARs. No waiver of any ARAR is being sought or invoked for any component of the selected remedy. The laws and regulations of concern include but are not limited to the following:

Chemical-Specific ARARs

Chemical-specific requirements are usually health-or risk-based numerical values or methodologies that establish the acceptable amount or concentration of a chemical in the ambient environment. The following are the chemical specific requirements for the Site.

Safe Drinking Water Act (SDWA) (42 U.S.C. 300(f)) (40 C.F.R. 141-147) establishes the development of national primary drinking water regulations. The regulations provide maximum contaminant level standards which drinking water quality cannot exceed. (Relevant and Appropriate).

The MCLs for the contaminants of concern at the Site include:

Contaminant	MCL, mg/l
Arsenic	0.05 mg/l
Chromium	0.1 mg/l

OAR 340-122-040 -080, and -090 requirements provide a process for determining required cleanup levels and measures for remedial action. (To Be Considered).

Location specific ARARs

No location-specific ARARs affect the remedial action to be implemented at the Site.

Action-Specific ARARs.

Action-specific ARARs are technology-or activity-based requirements or limitations on actions affecting hazardous substances. These requirements are triggered by the particular remedial activities selected to cleanup the Site.

A) Excavation of Contaminated Soil and Debris

Resource Conservation and Recovery Act (RCRA) requirements for the generation and transport of hazardous waste. RCRA requirements for hazardous waste generation and transportation are contained in 40 C.F.R. 262 and 263, respectively. Additional requirements for generation of hazardous wastes subject to LDR are contained in 40 C.F.R. 268. (Relevant and Appropriate).

Oregon Administrative Rules (OAR) Chapter 340 Divisions 100 to 110 and 120 regulate hazardous waste from the time of generation through transportation, storage, treatment and disposal. Divisions 100 to 106 incorporate, by reference, hazardous waste management regulations of the federal program, included in 40 C.F.R. Parts 260 to 266, 268, 270 and Subpart A of 124, into Oregon Administrative Rules. (Relevant and Appropriate).

B) Removal of Underground Storage Tanks

Oregon Administrative Rules (OAR) sections 340-122-205 through -360 regulate cleanup of soils contaminated by petroleum product leaks from USTs. These requirements include soil characterization, removal, and disposal associated with UST removal. If determined to be applicable, soils will be cleaned up to the numeric soil cleanup standards contained in OAR 340-122-335. (Applicable).

C) Demolition of Treatment Building and disposal of asbestos containing materials

National Emissions Standards for Hazardous Air Pollutants (NESHAP) provisions of the Clean Air Act regulate demolition and renovation of facilities containing asbestos and disposal of asbestos-contaminated wastes. Requirements for controlling asbestos emissions during demolition and renovation are contained in 40 C.F.R. 61.146 and 61.147. Requirements for disposal of asbestos-containing wastes from demolition and renovation activities are contained in 40 C.F.R. 61.152. (Applicable).

D) Air monitoring

OAR 340-21-050-060 contains requirements for fugitive emissions. (Applicable).

E) Groundwater monitoring

DEQ Guidelines for Groundwater Monitoring Well Drilling, Construction, and Decommissing (August 24, 1992) Section 6.0 contains procedures for monitoring well decommissioning (To Be Considered).

C. Cost-Effectiveness

The selected remedy is cost-effective when the degree of protectiveness it provides is compared to the overall protectiveness provided by the on-site treatment technologies. Given the uncertainties associated with the costs for the on-site treatment options they do not offer significant savings over the selected remedy and in fact could ultimately be substantially more costly.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

In selecting a remedy consideration was given to the total volumes of material to be remediated, the long term effectiveness and permanence, reduction in toxicity mobility or volume, short-term effectiveness; implementability; and cost. In addition consideration was given to the current and potential future use of the property. The selected remedy provides the best balance of tradeoffs in addressing these considerations.

The selected remedy provides a permanent solution with a proven technology to meet the LDR requirements. The selected remedy provides minimal uncertainty, and minimal long term-and short term risk. The selected remedy is more reliable, is cost-effective, and can be implement with less difficulty and no greater short term impacts than the other treatment alternatives. It is therefore considered to be the most appropriate solution to contamination at the Site and represents the maximum extent to which permanent solutions and treatment are practicable.

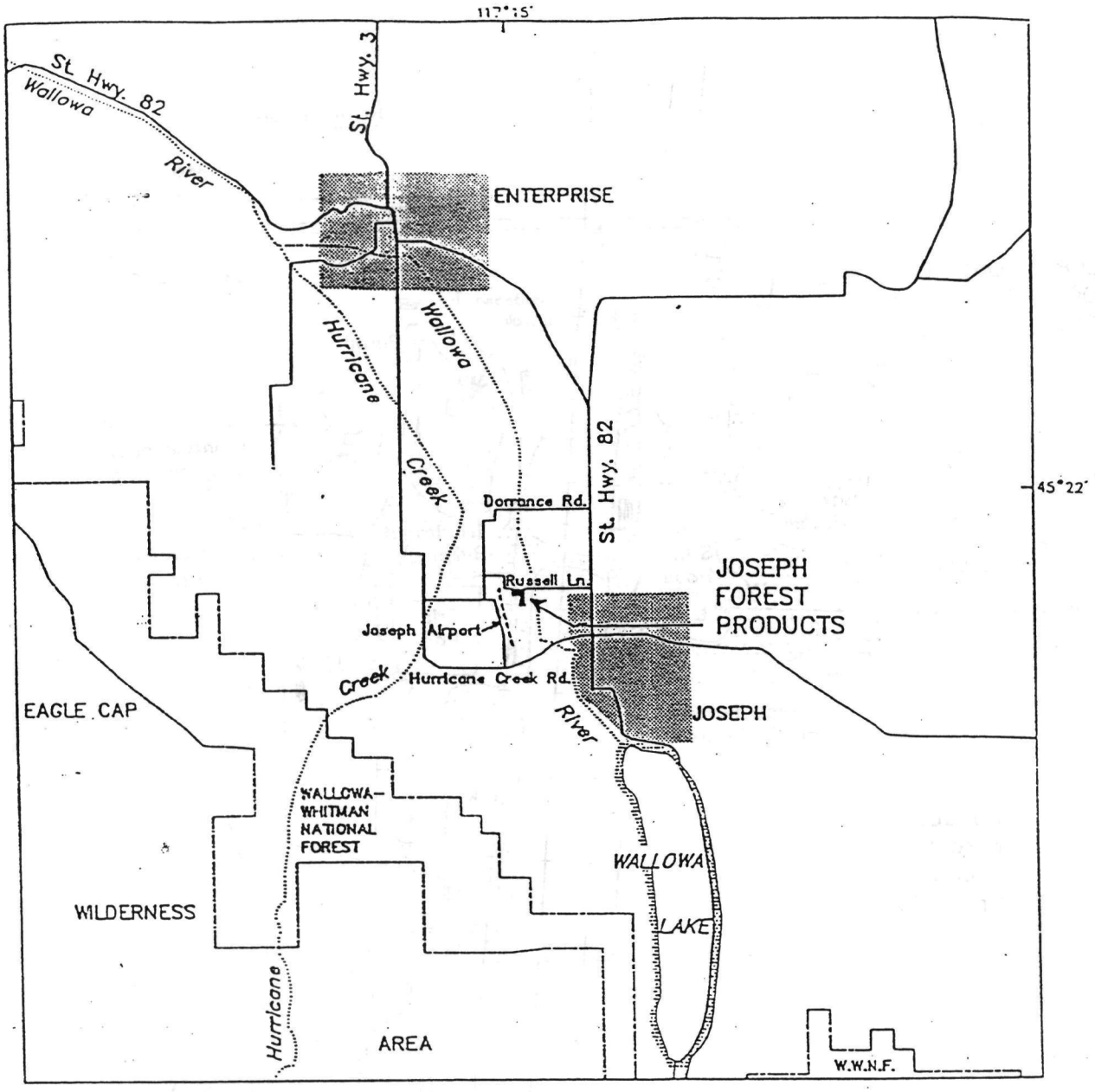
E. Preference for Treatment as a Principal Element

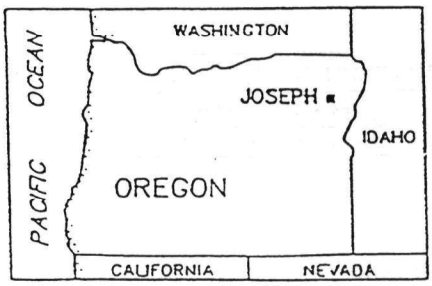
The selected remedy satisfies, in part, the statutory preference for treatment as a principal element. The principal threat to human health is from ingestion of and direct contact with contaminated soils. Soils which are classified as hazardous waste and subject to the treatment standards will be treated as required by the LDR requirements prior to disposal at an approved RCRA landfill. This remedy employs treatment technologies as required by the RCRA LDR requirements.

XI. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Site was released for public comment on August

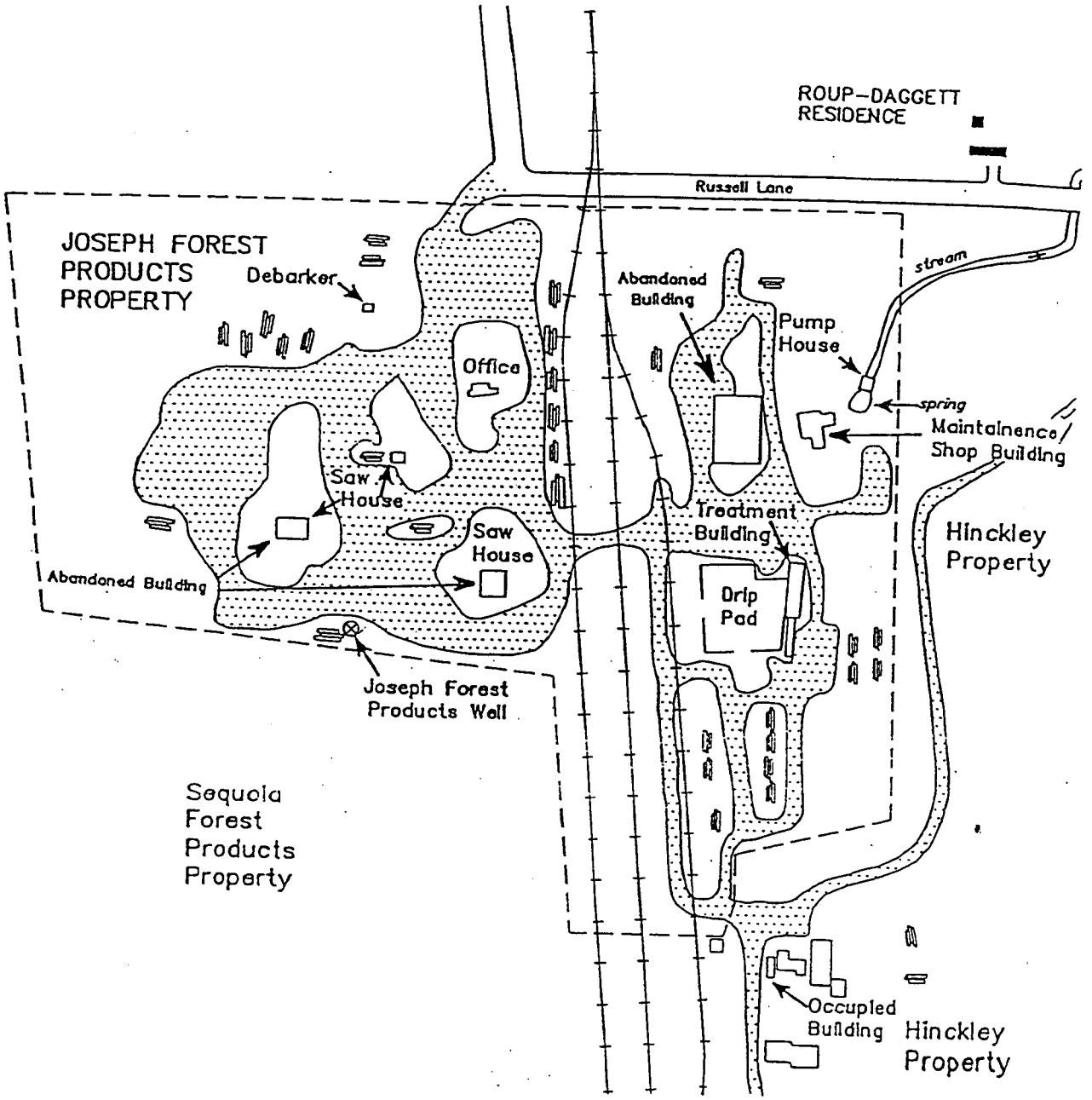
18, 1992. The proposed plan identified Alternative 4 as the preferred alternative. No written comments were received during the public comment period. No significant changes to the remedy, as it was originally identified in the Proposed Plan, have been made in this ROD.





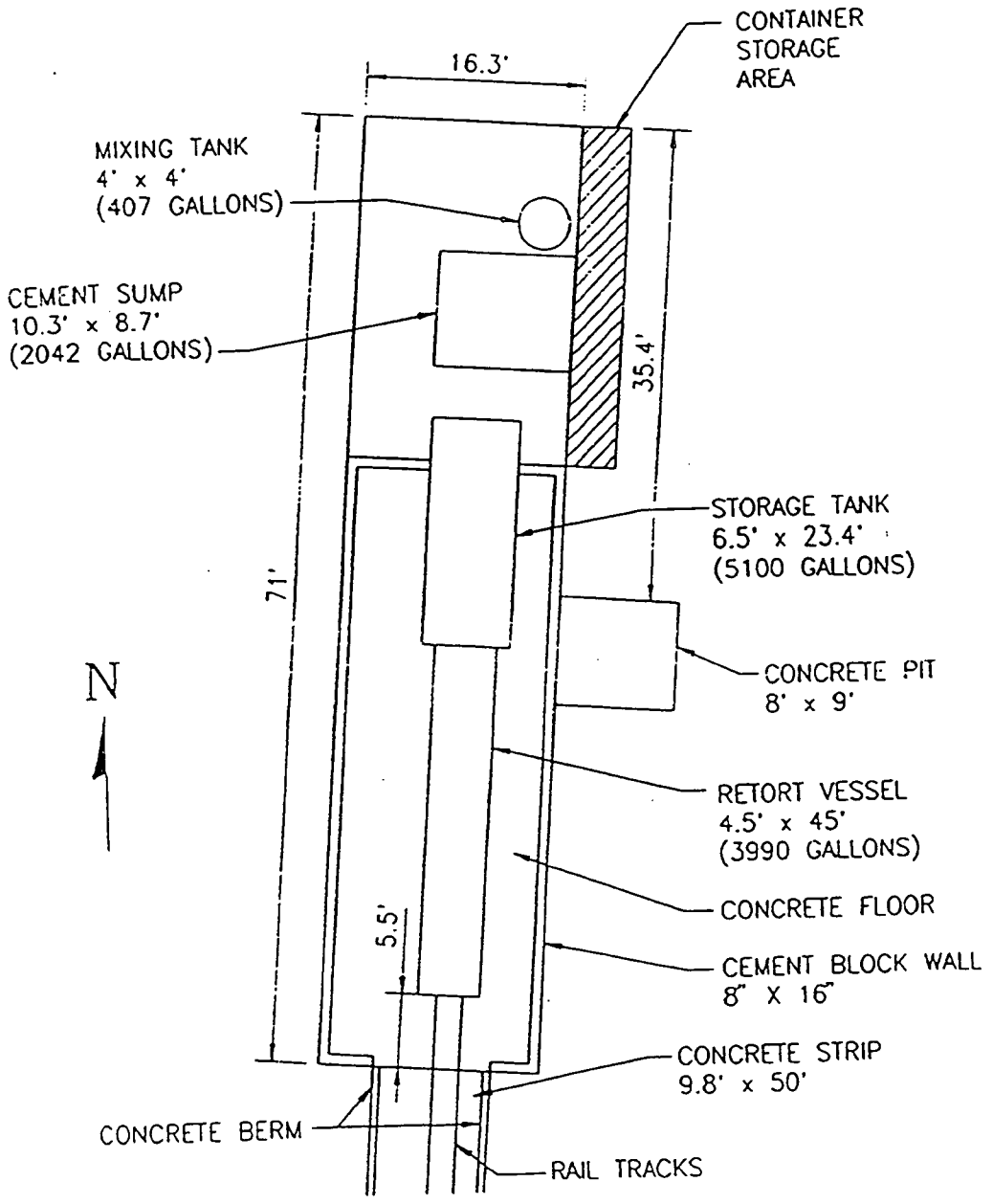
ecology & environment, inc.	
Job: R10-6509-08	Waste Site: OR0171
Drawn by: D. Pippenger	Date: August 25, 1986

FIGURE 1
LOCATION MAP
JOSEPH FOREST PRODUCTS
JOSEPH, OR



ecology & environment, inc.	
Job: R10-8509-08	Waste Site: OR0171
Drawn by: D. Pippenger	Date: August 25, 1986

FIGURE 2
SITE MAP
JOSEPH FOREST PRODUCTS
Joseph, OR



Not to Scale

Figure 3

LAYOUT OF THE JOSEPH FOREST PRODUCTS TREATMENT BUILDING

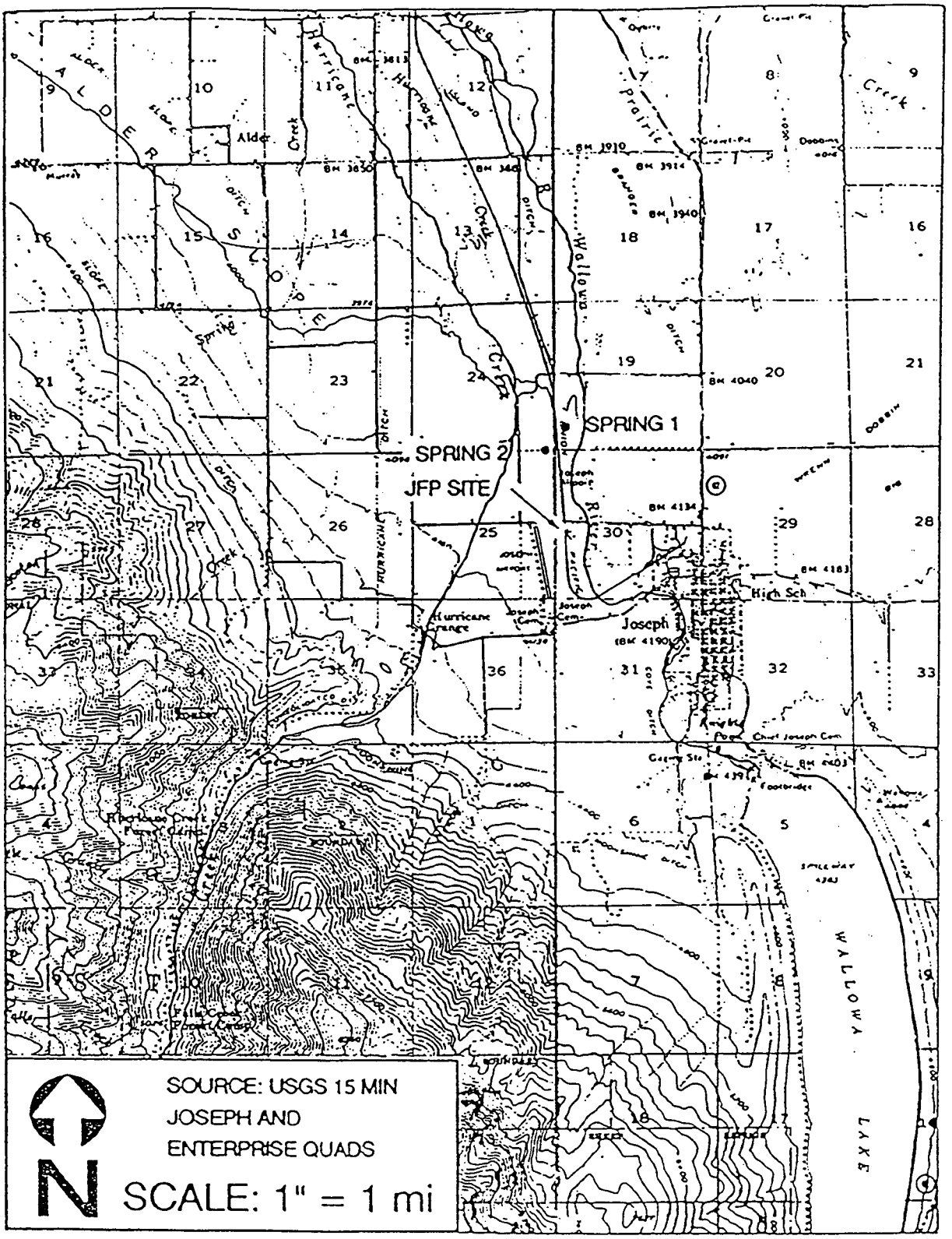
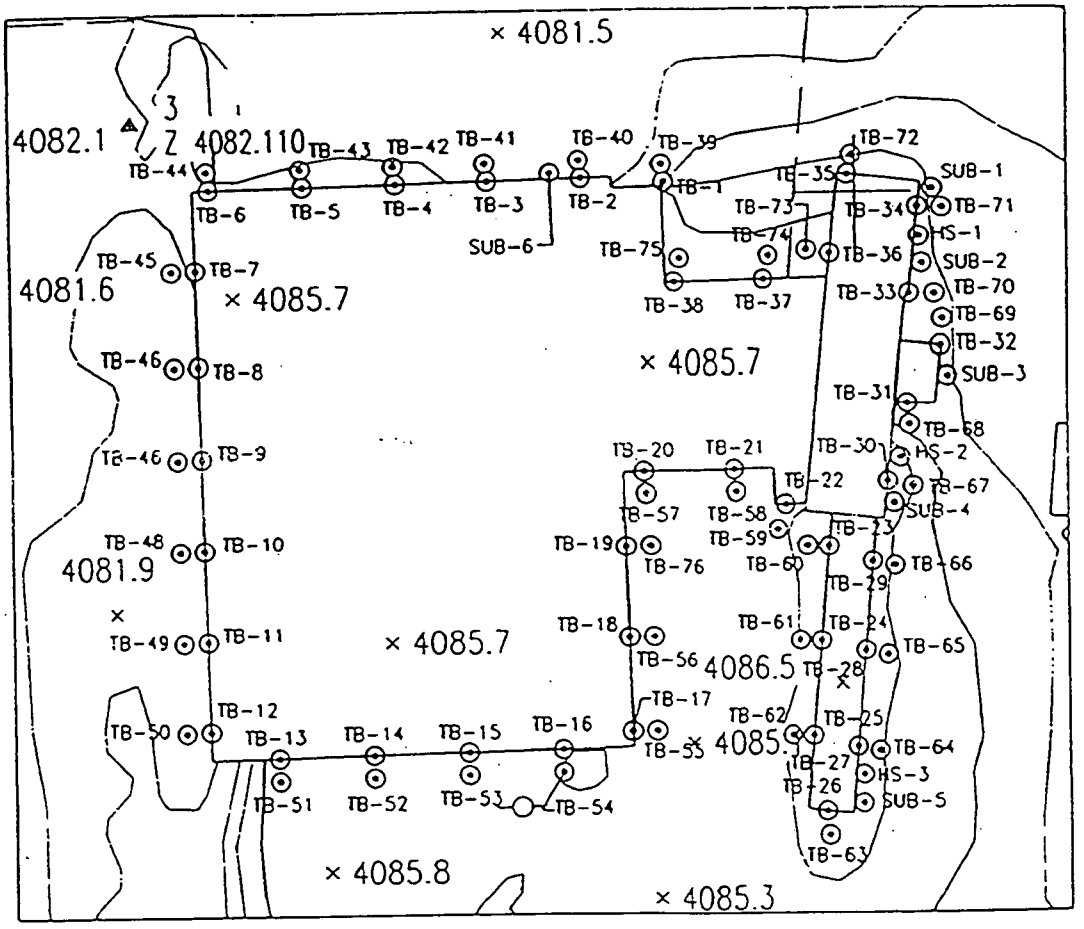


FIGURE 4

MAJOR SURFACE WATER FEATURES NEAR JFP SITE



0 40 80

Scale

Figure 5

LOCATIONS OF SOIL SAMPLES AROUND TREATMENT BUILDING AND DRIP PAD

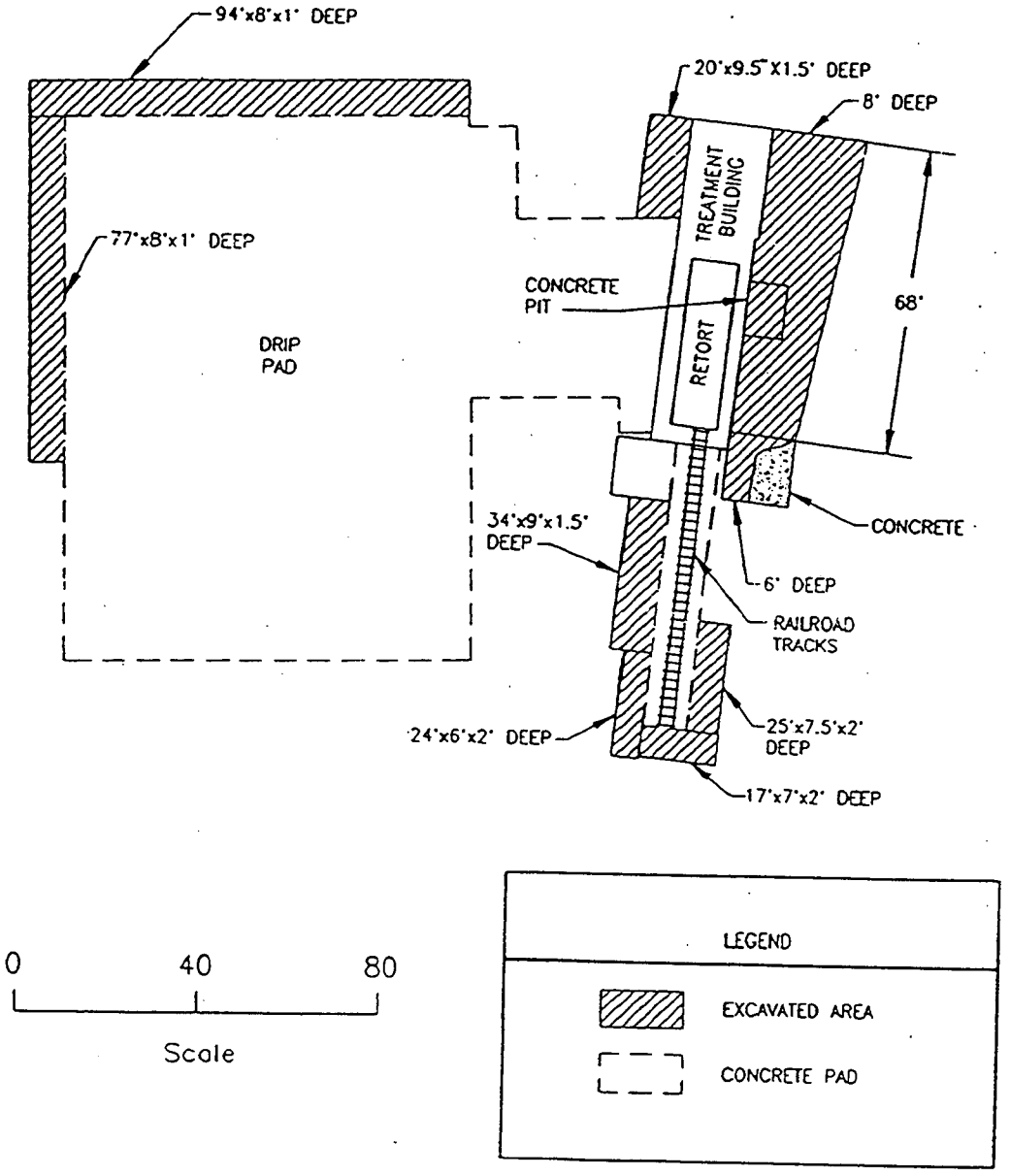


Figure 6

LOCATIONS OF AREAS EXCAVATED DURING REMOVAL ACTION

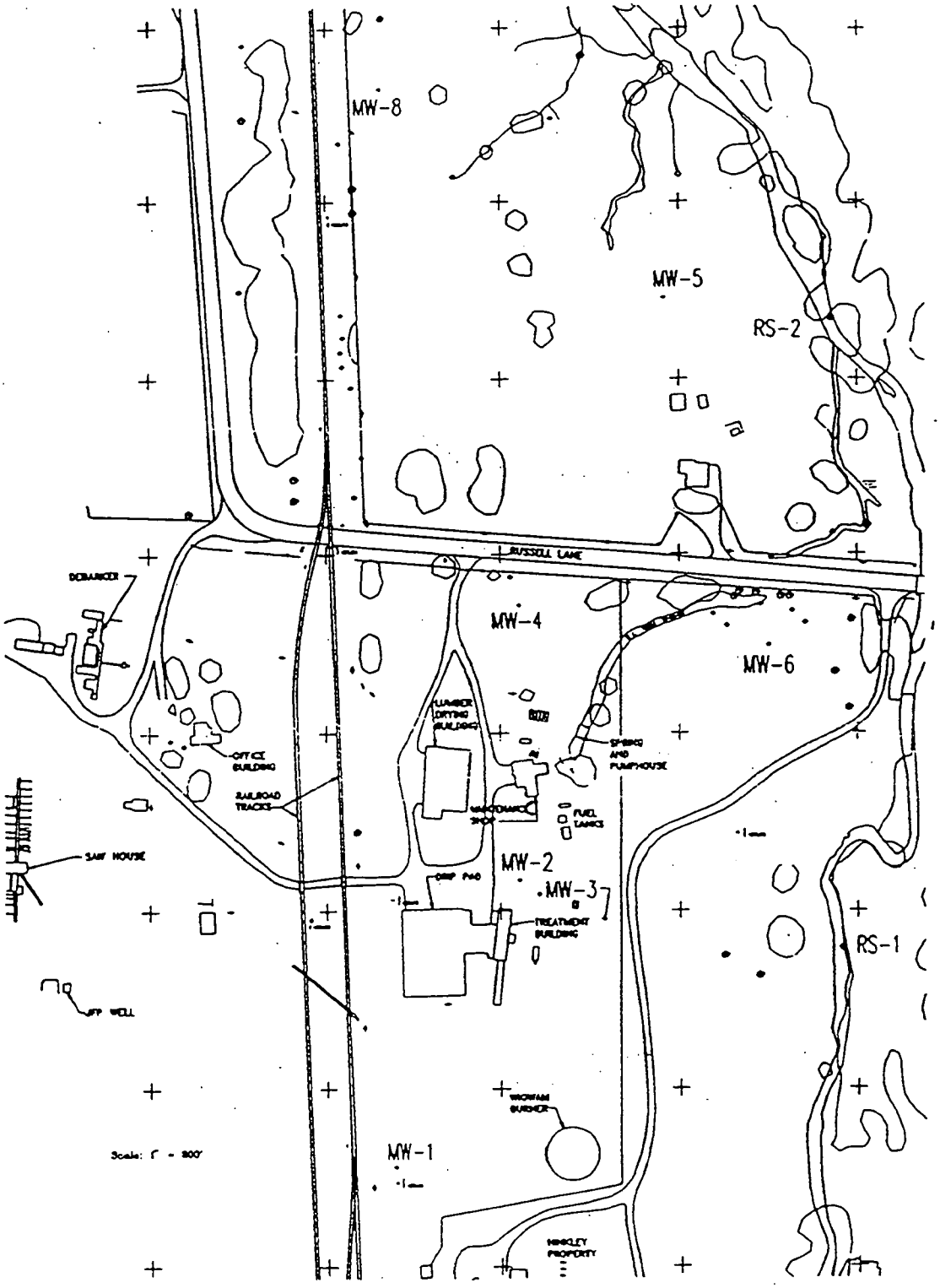


FIGURE 7

LOCATIONS OF SURFACE WATER AND GROUNDWATER SAMPLES

TABLE 1

SUMMARY OF RESULTS OF METAL ANALYSIS OF BACKGROUND SOIL SAMPLES

ELEMENT	DETECTION LIMITS mg/kg	FREQUENCY OF DETECTION	RANGE OF DETECTIONS mg/kg	GEOMETRIC MEAN CONCENTRATION mg/kg
Aluminum	NA	12/12	9,540 - 18,000	13,400
Antimony	3.8 - 4.4	2/12	4.0 - 4.1	4.0
Arsenic	NA	12/12	3.7 - 10.6	5.2
Barium	NA	12/12	70.0 - 385	137
Beryllium	0.18 - 0.21	3/12	0.18 - 0.19	0.19
Cadmium	0.36 - 0.85	3/12	0.45 - 0.46	0.46
Calcium	NA	12/12	30,200 - 82,300	56,100
Chromium	NA	12/12	9.5 - 22.0	12.7
Cobalt	NA	12/12	6.8 - 13.5	9.0
Copper	NA	12/12	27.8 - 44.3	35.6
Iron	NA	12/12	13,300 - 24,600	17,600
Lead	NA	12/12	4.3 - 200	10.6
Magnesium	NA	12/12	3,790 - 5,240	4,460
Manganese	NA	12/12	212 - 1,040	439
Mercury	0.08 - 0.10	0/12	NA	NA
Nickel	NA	12/12	12.6 - 19.1	15.5
Potassium	NA	12/12	1,520 - 5,450	2,330
Selenium	0.35 - 0.80	6/12	0.44 - 1.30	0.59
Silver	1.4 - 1.7	0/12	NA	NA
Sodium	NA	12/12	478 - 1,110	720
Thallium	0.35 - 0.41	0/12	NA	NA
Vanadium	NA	12/12	30.5 - 68.2	44.6
Zinc	NA	12/12	49.3 - 111	69.4

TABLE 2

SUMMARY OF RESULTS OF METAL ANALYSIS OF TREATMENT BUILDING AND DRIP PAD PERIMETER SOIL SAMPLES

ELEMENT	DETECTION LIMITS mg/kg	FREQUENCY OF DETECTION	RANGE OF DETECTIONS mg/kg	GEOMETRIC MEAN CONCENTRATION mg/kg
Aluminum	NA	90/90	5,320 - 21,300	10,100
Antimony	2.2 - 33	35/90	2.3 - 59.8	8.4
Arsenic	NA	90/90	18 - 26,100	387
Barium	NA	90/90	43.9 - 2,670	117
Beryllium	0.10 - 0.37	24/90	0.10 - 0.35	0.15
Cadmium	0.37 - 1.4	63/90	0.30 - 107	1.7
Calcium	NA	90/90	6,720 - 168,000	59,500
Chromium	NA	90/90	32.6 -11,300	376
Cobalt	NA	90/90	5.1 - 227	12.3
Copper	NA	90/90	41 - 22,200	443
Iron	NA	90/90	10,100 - 72,100	19,700
Lead	NA	90/90	4.7 - 1,880	62.5
Magnesium	NA	90/90	2,700 - 9,900	4,370
Manganese	NA	90/90	140 - 7,040	329
Mercury	0.08 - 0.18	12/44	0.09 - 0.29	0.15
Molybdenum	NA	46/46	0.83 - 12	3.5
Nickel	NA	90/90	11.7 - 232	38.0
Potassium	NA	90/90	957 - 14,600	1,700
Selenium	0.59 - 25	19/90	0.67 - 25	1.6
Silver	0.20 - 3.0	18/90	0.20 - 15.9	1.0
Sodium	NA	90/90	312 - 1,270	592
Thallium	0.38 - 6.3	1/90	5.0	5.0
Vanadium	3.75	89/90	17 - 85.5	39.0
Zinc	NA	90/90	37.7 - 15,500	277

TABLE 3

SUMMARY OF RESULTS OF METAL ANALYSIS OF SUBSURFACE SOIL SAMPLES

ELEMENT	DETECTION LIMITS mg/kg	FREQUENCY OF DETECTION	RANGE OF DETECTIONS mg/kg	GEOMETRIC MEAN CONCENTRATION mg/kg
Aluminum	NA	23/23	12,600 - 59,000	38,300
Antimony	4.0	6/23	4.0 - 348	61.2
Arsenic	NA	23/23	44 - 104,000	1,630
Barium	NA	23/23	161 - 719	335
Beryllium	3.6	14/23	9.1 - 25.9	11.8
Cadmium	11.6 - 11.8	0/23	NA	NA
Calcium	NA	23/23	10,300 - 200,000	87,100
Chromium	NA	23/23	300 - 46,100	2,040
Cobalt	21.6	0/23	NA	NA
Copper	7.2	17/23	282 - 34,400	4,230
iron	NA	23/23	19,800 - 38,500	27,200
Lead	23.6	22/23	25.4 - 1,060	280
Magnesium	NA	23/23	3,830 - 18,800	12,500
Manganese	NA	23/23	350 - 1,020	500
Mercury	0.30	1/23	0.64	0.64
Nickel	27.4 - 52.0	0/23	NA	NA
Selenium	NA[1]	0/23	NA	NA
Silver	NA[1]	0/23	NA	NA
Sodium	820	22/23	1,220 - 11,000	7,260
Thallium	223 - 3,490	0/23	NA	NA
Vanadium	NA	23/23	54.3 - 148	101
Zinc	NA	23/23	67.6 - 2,100	270

[1] All results for selenium and silver were flagged as unusable.

TABLE 4

CONCENTRATIONS OF TOTAL ARSENIC, CHROMIUM, AND COPPER IN SOIL SAMPLES COLLECTED DURING REMOVAL ACTION

SAMPLE NUMBER	ARSENIC, mg/kg	CHROMIUM, mg/kg	COPPER, mg/kg
T1100052	437	175. N	42.5
T1100053	223	91.9 N	195
T1100054	496	92.9 N	619
T1100056	22.6	31.0 N	49.7
T1100057	20.1 J	21.4 N	40.8
T1100058	10.1 U	20.0 N	35.1
T1100059	11.1 UJ	16.5 N	28.1
T1100060	10.5 U	26.2 N	39.0
T1100061	40.4	50.1 N	75.9
T1100062	10.5 U	33.9 N	34.5
T1100068	720. J	88.7 N	764
T1100073	657	74.8	63.5
T1100074	658	75.2	72.7
T1100075	310	57.2	47.8
T1100076	330	67.3	163
T1100077	61.1	27.2	72.9
T1100078	411	94.6	258
T1100079	425	89.5	313
T1100081	10.0 U	25.4	36.6
T1100082	26.3	11.2	44.9
T1100083	12.0	20.2	49.3
T1100084	42.0	25.1	63.7
T1100085	101	71.5	91.5
T1100086	205	155	113
T1100087	177	184	166
T1100089	131	90.1	155
T1100090	111	85.2	117
T1100091	202	126	90.7
T1100092	35.3	17.1	31.4
T1100093	360	133	65.3
T1100094	86.9	64.3 R	49.2
T1100096	18.2	29.7 R	43.9

CONCENTRATIONS OF TOTAL ARSENIC, CHROMIUM, AND COPPER IN SOIL SAMPLES COLLECTED DURING REMOVAL ACTION (Continued)

SAMPLE NUMBER	ARSENIC, mg/kg	CHROMIUM, mg/kg	COPPER, mg/kg
T1100097	95.4	84.7 R	133
T1100098	11.0 U	23.3 R	29.6
T1100099	121	102. R	147
T1100100	11.2	20.6 R	41.4
T1100300	851. J	515. J	888. J
T1100301	31.0	23.8 R	50.2
T1100302	156	92.6 R	196
T1100308 (Dup. T1100302)	161	98.5 R	202
T1100303	27.4	23.0 R	48.9
T1100304	302	198. R	659
T1100305	11.0	21.8 R	40.8
T1100309	103. J	196. J	116. J
T1100310	200. J	193. J	195. J
T1100311	10.9 UJ	17.9 J	41.1 J
T1100312	10.9 UJ	23.1 J	48.7 J
T1100313	124. J	187. J	51.0 J
T1100314	188. J	248. J	143. J
T1100315	370. J	297. J	138. J
T1100316	399. J	327. J	291. J
T1100317	206. J	249. J	72.0 J
T1100318	123. J	126. J	93.2 J
T1100319	425. J	329. J	307. J
T1100321 (Dup. T1100319)	698. J	576. J	541. J
T1100320	150. J	154. J	159. J
T1100325	16,500	1,860	15,300
T1100326	26,200	4,950	28,700
T1100327	51.8	57.7	203
T1100328	59.2 J	20.2	45.7 J

TABLE 5

CONCENTRATIONS OF TOTAL METALS IN SOIL SAMPLES FROM BENEATH DRIP PAD

ELEMENT, mg/kg	SAMPLE DP1-01-00	SAMPLE DP2-01-00	SAMPLE DP3-01-00
Aluminum	9,510	9,120	12,700
Antimony	2.3 UJ	2.0 UJ	2.1 UJ
Arsenic	341	107	51
Barium	69.8	40.0 B	93.3
Beryllium	0.23 U	0.20 U	0.21 U
Cadmium	0.79 B	0.94 B	0.68 B
Calcium	79,800	97,200	42,700
Chromium	284	129	34.6
Cobalt	6.6 B	7.8 B	12.6
Copper	157	65.8	61.4
Iron	14,700	14,500	21,300
Lead	5.6	2.0	4.0
Magnesium	4,740	4,420	5,060
Manganese	239. J	165. J	390. J
Mercury	0.11 UJ	0.10 UJ	0.14 J
Nickel	13.9	15.5	19.5
Potassium	1,360	1,040	1,630
Selenium	3.5 UJ	3.5 UJ	3.5 UJ
Silver	0.93 U	0.81 U	0.85 U
Sodium	574. J	655. J	488. J
Thallium	0.46 U	0.42 U	0.44 U
Vanadium	30.3	27.4	48.4
Zinc	67.2 J	34.6 J	52.2 J

B Reported value is less than contract required detection limit but is greater than instrument detection limit.

U Element was analyzed for, but not detected above the level of the associated value.

J Analyte was detected but numerical value may not be consistent with amount actually present in the environmental sample

TABLE 6

SUMMARY OF RESULTS OF METAL ANALYSIS OF STORAGE AREA SOIL SAMPLES

ELEMENT	DETECTION LIMITS mg/kg	FREQUENCY OF DETECTION	RANGE OF DETECTIONS mg/kg	GEOMETRIC MEAN CONCENTRATION mg/kg
Aluminum	NA	47/47	6,880 - 13,600	10,400
Antimony	3.7 - 5.0	6/47	3.9 - 5.9	4.7
Arsenic	NA	47/47	5.7 - 661	36.6
Barium	NA	47/47	51.6 - 166	83.5
Beryllium	0.18 - 0.24	10/47	0.18 - 0.28	0.21
Cadmium	0.35 - 0.86	4/47	0.57 - 0.88	0.76
Calcium	NA	47/47	17,800 - 207,000	80,000
Chromium	NA	47/47	11.9 - 781	47.3
Cobalt	NA	47/47	5.9 - 12.9	9.2
Copper	NA	47/47	33.4 - 825	76.1
Iron	NA	47/47	12,200 - 41,600	18,400
Lead	NA	47/47	3.0 - 204	18.2
Magnesium	NA	47/47	3,220 - 6,690	4,760
Manganese	NA	47/47	170 - 743	325
Mercury	0.08 - 0.13	9/47	0.08 - 0.14	0.10
Nickel	NA	47/47	11.2 - 30.9	16.4
Potassium	NA	47/47	1,350 - 2,580	1,830
Selenium	0.35 - 0.75	27/47	0.41 - 4.3	1.1
Silver	1.4 - 1.9	3/47	1.6 - 27.1	4.1
Sodium	NA	47/47	347 - 663	517
Thallium	0.35 - 0.49	4/47	0.37 - 0.47	0.42
Vanadium	NA	47/47	32.1 - 65.8	46.7
Zinc	NA	47/47	39.4 - 207	69.0

TABLE 7

SUMMARY OF RESULTS OF TOTAL METALS ANALYSIS OF GROUNDWATER SAMPLES

ELEMENT	DETECTION LIMITS ug/L	FREQUENCY OF DETECTION	RANGE OF DETECTIONS mg/kg	GEOMETRIC MEAN CONCENTRATION mg/kg
Aluminum	32.0 - 644	38/41	90.8 - 106,000	4,050
Antimony	20.0 - 39.7	0/41	NA	NA
Arsenic	1.5 - 3.0	20/41	1.6 - 168	8.0
Barium	10.0 - 13.9	38/41	8.8 - 395	37.1
Beryllium	1.0 - 2.5	7/41	1.2 - 1.8	1.4
Cadmium	2.0 - 5.0	1/41	2.3	2.3
Calcium	NA	41/41	36,300 - 123,000	62,200
Chromium	5.0	26/41	5.0 - 164	17.7
Cobalt	2.0 - 40.0	15/41	4.1 - 106	21.2
Copper	2.0 - 14.2	23/41	4.6 - 459	44.4
Iron	NA	41/41	70.3 - 144,000	3,940
Lead	1.0 - 163	24/41	1.1 - 45	4.2
Magnesium	NA	41/41	2,940 - 45,000	6,350
Manganese	NA	41/41	1.7 - 2,800	77.1
Mercury	0.04 - 0.20	0/41	NA	NA
Molybdenum	2.0	3/16	2.1 - 2.7	2.5
Nickel	10.0 - 104	6/41	11.0 - 121	25.3
Potassium	604	40/41	1,090 - 7,680	2,300
Selenium	2.0 - 30.0	0/41	NA	NA
Silver	2.0 - 4.0	6/41	5.3 - 15.0	7.7
Sodium	NA	41/41	1,660 - 14,000	5,900
Thallium	1.0 - 2.5	0/41	NA	NA
Vanadium	2.0 - 5.0	31/41	2.5 - 463	25.7
Zinc	4.0 - 56.9	27/41	6.7 - 239	35.4

TABLE 8

CONCENTRATIONS OF DISSOLVED TARGET METALS ABOVE DETECTION LIMITS IN GROUNDWATER SAMPLES

SAMPLE LOCATION AND DATE	DISSOLVED ARSENIC ug/L	DISSOLVED CHROMIUM ug/L	DISSOLVED COPPER ug/L	DISSOLVED LEAD ug/L	DISSOLVED ZINC ug/L
MW1					
July 1990			32.5	4.2	29.7
Oct. 1990					5.8 J
MW2					
July 1990	12.0 S	7.0 B			
(Dup.)	10.3	14.4			
Oct. 1990	14.8				
Jan. 1991	11.5				
Sep. 1991		15.2			
Apr. 1992	6.3 B				
MW3					
MW 4					
Apr. 1992		3.5 B	4.7 B	2.0 BJ	38.6
MW5					
MW6					
Oct. 1990					5.9 J
Apr. 1992				1.2 B	
MW 8					
Apr. 1992				1.7 B	
JFP Well					
July 1990					29.2

B For samples collected during July 1990, April 1991, September 1991, and April 1992: Reported value is less than contract required detection limit but is greater than instrument detection limit.

For samples collected during October 1990 and January 1991: Analyte was detected in analytical blank as well as in sample.

J Analyte was detected but numerical value may not be consistent with amount actually present in the environmental sample.

S Reported value determined by method of standard additions

TABLE 9

SUMMARY OF RESULTS OF RISK CHARACTERIZATION

Scenario	Exposure Pathway	Location	Hazard Index	Excess Cancer Risk
Current Use - On-Site Workers	Ingestion of Soil	Background Areas	0.02	$2x10^{-6}$
		Storage Areas	0.14	$2x10^{-5}$
		Treatment Building	3.15	$6x10^{-4}$
	Inhalation of Windblown Dust		0.0015	$2x10^{-8}$
Current Use - Nearby Resident, Adult	Ingestion of Water		Average 0.56 RME 2.51	Average $1x10^{-5}$ RME $1x10^{-4}$
Current Use - Nearby Resident, Child	Ingestion of Water		5.86	$6x10^{-5}$
Future Use - On-Site Resident, Adult	Ingestion of Soil	Background Areas	Average 0.040 RME 0.14	Average $1x10^{-6}$ RME $2x10^{-5}$
		Storage Area 1	Average 0.33 RME 1.16	Average $2x10^{-5}$ RME $2x10^{-4}$
		Storage Area 2	Average 0.14 RME 0.48	Average $8x10^{-6}$ RME $9x10^{-5}$
		Storage Area 3	Average 0.12 RME 0.40	Average $6x10^{-6}$ RME $7x10^{-5}$
		Storage Area 4	Average 0.80 RME 2.77	Average $5x10^{-5}$ RME $6x10^{-4}$
		Treatment Building	Average 6.93 RME 23.84	Average $4x10^{-4}$ RME $5x10^{-3}$
	Inhalation of Windblown Dusts	Storage Area 1	Average 0.00062 RME 0.00078	Average $2x10^{-9}$ RME $1x10^{-8}$
		Storage Area 2	Average 0.00007 RME 0.00009	Average $3x10^{-10}$ RME $1x10^{-9}$

TABLE 10

PRELIMINARY REMEDIATION GOALS FOR GROUNDWATER

Chemical	Noncarcinogens[a,b] (ug/L)		Carcinogens[b,c] (ug/L)				Maximum Contaminant Levels (MCLs) [and goals (MCLGs)] (ug/L)
	Hazard Quotient = 1		10^{-6} risk		10^{-4} risk		
	Residential	Industrial	Residential	Industrial	Residential	Industrial	
Arsenic	11	31	0.05	0.16	5	16	50 [50 proposed]
Chromium III	36,500	102,200					100 (total Cr) [100]
Chromium VI	183	511					100 (total Cr) [100]
Copper	1351	3781					1300 AL[d] [1300]
Lead			NA[e]	NA[e]	NA[e]	NA[e]	50[f]; 15 AL[d] [0]
Manganese	3650	10,220					50–secondary MCL[g]
Vanadium	256	715					
Zinc	7300	20,440					5000–secondary MCL[g]

[a] Reference doses for all chemicals of concern were obtained from EPA's Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST). Exposure factors were obtained from EPA Region 10 Supplemental Risk Assessment Guidance for Superfund, dated August 16, 1991.

[b] Groundwater PRGs are based on ingestion only.

[c] The cancer slope factor for arsenic was obtained from EPA's Integrated Risk Information System (IRIS). Exposure factors were obtained from EPA Region 10 Supplemental Risk Assessment Guidance for Superfund, dated August 16, 1991.

[d] An action level is an MCL that is exceeded if the concentration in more than 10 percent of the targeted tap samples is greater than the specified value.

[e] There are no toxicity numbers for lead; however, it is classified as a B2 carcinogen, a probable human carcinogen with sufficient animal data but insufficient human data.

[f] The MCL of 50 ug/l for lead is in effect until December 7, 1992, when the action level of 15 ug/l will take its place.

[g] A secondary MCL is not health-based, but rather is based on aesthetic considerations such as taste and smell.

TABLE 11

PRELIMINARY REMEDIATION GOALS FOR SOIL

Chemical	Noncarcinogens[a,b] (mg/kg)		Carcinogens[b,c] (mg/kg)			
	Hazard Quotient = 1.0		10^{-6} risk		10^{-4} risk	
	Residential	Industrial	Residential	Industrial	Residential	Industrial
Arsenic[d]	81	612	0.4	3	36	336
Chromium III	270,270	2,040,816				
Chromium VI	1,351	10,204				
Copper	10,000	75,510				
Lead	500[e]	1,000[e]	NA[f]	NA[f]	NA[f]	NA[f]
Manganese	27,027	204,082				
Vanadium	1916	14,308				
Zinc	54,051	408,163				

[a] Reference doses for all chemicals of concern were obtained from EPA's Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST). Exposure factors were obtained from EPA Region 10 Supplemental Risk Assessment Guidance for Superfund, dated August 16, 1991.

[b] Soil PRGs are based on ingestion only.

[c] The cancer slope factor for arsenic was obtained from EPA's Integrated Risk Information System (IRIS) and Health Effects Assessment Summary Tables (HEAST). Exposure factors were obtained from EPA Region 10 Supplemental Risk Assessment Guidance for Superfund, dated August 16, 1991.

[d] For comparison, background sample levels of arsenic in soil at the JFP site range from 3.7 to 10.6 mg/kg.

[e] For lead, OSWER Directive #9355.4-02 was followed.

[f] There are no toxicity numbers for lead; however, it is classified as a B2 carcinogen, a probable human carcinogen with sufficient animal data but insufficient human data.

NOTE: The 10^{-4} industrial PRG is associated with an arsenic cleanup level of 336 mg/kg. The "industrial" designation means the estimated risks would apply to a worker assuming future industrial land use. The 10^{-5} industrial PRG is associated with an arsenic cleanup level of 36 mg/kg, which is also approximately equal to the 10^{-4} residential level (assuming future residential use). The Site is currently zoned for industrial use and future industrial land use is expected. The 10^{-5} soil cleanup level for industrial land use is shown in Tables 11, 12 and 13 as the "residential" PRG.

TABLE 12

SUMMARY OF ACTIONS TO BE TAKEN AT EACH CONTAMINATED AREA
UNDER DIFFERENT ALTERNATIVES

Area	Alternatives			
	1	2 and 3	4 and 5	6
East of Treatment Building, Bottom of Removal Excavation	No action.	Soil beneath excavation to background.	No action.	No action.
Drip Pad Perimeter, Bottom of Removal Excavation	No action.	Soil beneath excavations to background.	Soil beneath excavations to residential PRG.	No action.
Drip Pad Perimeter, Areas not Excavated	No action.	All soil to background.	All soil to residential PRG.	No action.
Under Treatment Building	No action.	All soil to background.	All soil to industrial PRG.	All soil to industrial PRG.
Under Drip Pad	No action.	All soil to background.	No action.	No action.
Storage Areas	No action.	All four areas to background.	Areas 1 and 4 to residential PRG.	No action.

TABLE 13

SUMMARY OF AREAS AND VOLUMES OF SOIL FOR DIFFERENT ALTERNATIVES

Scenario and Alternatives	Affected Areas	Surface Area, sq feet	Volume Contaminated Soil, cu yd	Volume Clean Soil, cu yd
No Action - Alterative 1	None	0	0	0
Cleanup to Background - Alternatives 2 and 3	Below removal excavation, east of treatment building	1517	129	430
	Below removal excavations, drip pad perimeter	2315	232	113
	Drip pad perimeter not excavated during removal	2560	379	0
	Under treatment building	1647	490	0
	Under drip pad	12,950	1440	0
	All storage areas	75,632	5609	0
	Total	96,621	8279	543
Surface Soil to Residential PRG, Subsurface soil to Industrial PRG - Alternatives 4 and 5	Below removal excavations, drip pad perimeter	2315	146	113
	Drip pad perimeter not excavated during removal	2560	285	0
	Under treatment building	1647	387	0
	Storage areas 1 and 4	53,370	1978	0
	Total	59,892	2796	113
Subsurface Soil to Industrial PRG - Alternative 6	Under treatment building	1647	369	0

TABLE 14

Final Remediation Goals

Final Remediation Goals			Risk Levels	
Medium	**Chemical**	**Cleanup Level (mg/kg)**	**Cancer Risk**	**Non-cancer Hazard Index**
Surface Soil	Arsenic	36	10 -5	
	Chromium	1,351		1.0
	Copper	10,000		1.0
Subsurface Soil	Arsenic	336	10 -4	
	Chromium	1,351		1.0
	Copper	10,000		

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

September 28, 1992

Ms. Dana Rasmussen
Regional Administrator
U.S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98102

Re: Joseph Forest Products
Proposed Remedial Action

Dana
Dear Ms. Rasmussen:

The Oregon Department of Environmental Quality (DEQ) has reviewed EPA's proposed remedial action for the Joseph Forest Products site as presented in the draft Record of Decision. I am pleased to advise you that DEQ concurs with EPA's proposed remedial action, based on Alternative 4 of the Feasibility Study. DEQ also concurs with EPA's proposed cleanup levels for the site.

I find that this alternative satisfies all applicable state statutory requirements and administrative rules pertaining to the degree of cleanup required and remedy selection process. Specifically, this alternative is protective, cost-effective, effective, implementable, and uses permanent solutions to the maximum extent practicable in accordance with ORS 465.315 and OAR 340-122-040 and 090.

The DEQ looks forward to the implementation of the remedial action. Please let us know if we can provide further assistance.

Sincerely,

Fred Hansen
Director

cc: Chip Humphrey, EPA-000
Jill Kiernan, DEQ

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